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To the citizens of the
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TO THE CITIZENS

OF THE

COMMONWEALTH OF PENNSYLVANIA.

Friends and Fellow Citizens,

Having had the honour of being appointed by the Convention at Harrisburg, a Committee to address the citizens of the state on the subject of its internal improvement, particularly as regards opening a communication between its eastern and western waters; we solicit your attention to the facts and reasonings on this important subject, which we respectfully submit to your consideration; with a hope, that they will, with every well-constituted mind, remove all doubt of the eligibility of the undertaking, on a scale worthy of the great state we inhabit—a state second to none in the Union, in point of natural advantages of every description.

In calling the attention of the citizens of Pennsylvania to the subject of this address, it is our purpose to rest our assertions upon ascertained and incontrovertible data; and we ask no confidence but that to which we shall entitle ourselves by the facts to which we shall refer. Experience is the most certain test of all human undertakings; and, therefore, to establish the utility of the improvement of the state generally, and especially of the proposed communication between its eastern and western sections, it is fortunate that we are not obliged to depend on theory, which, however plausible, is often fallacious. Internal improvements, which cheapen and facilitate the means of communication between different countries and different portions of the same country, have the testimony of the civilized world in their favour—and their effects upon the prosperity and happiness of the people of every nation in which they exist, are in full proof. We can appeal to the experience of Great Britain, of Holland,* of France, and of China, on the subject of canals generally, and to that of New York, in her two great canals—cases which are irresistibly convincing on this subject.

Postponing for the present, an exhibition of the benefits which will result from the completion of a communication be-

* The Dutch have recently cut a canal calculated for the largest ships of the line. It is said to be 48 miles long—although some accounts state only 35. The depth is twenty-four feet. There are two sets of locks, five of 51 feet wide and 200 long—the others, lateral ones, 18 feet wide for smaller vessels. As soon as it was opened, a frigate of 44 guns, and a large East India vessel, passed each other in it without inconvenience. They were dragged by six horses. The excavation was attended with difficulties which would have appalled any other people than the Dutch; as the canal was cut through a spongy morass, where they were obliged to extract the fluid earth by scoop nets instead of spades.

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tween lake Erie and the Ohio and Susquehanna, inc. dent of the revenue to be derived from such a work, wish to call your attention to the progress and success of the New York grand canals in the first instance.

The Erie canal, 353 miles in length, was begun July 4, 1817, and will be completed in the course of next month. In 1821, there were 94 miles navigable; in 1822, 116; in 1823, 160; and in 1824, 280. The tolls received in 1821, were $23,000; in 1822, $57,160; in 1823, $105,037; and in 1824, $294,546; thus almost trebling in the last year, even before the completion of the work. The Champlain Canal is 61 miles long. The tolls on it in 1823, were $26,966 —in 1824, $46,214. The total expenditure on both canals, (exclusive of the tolls,) has been $8,829,055: to complete the works, and pay damages, will require $800,000 more— making the sum actually raised and to be raised $9,629,055. Add the tolls, which have been appropriated to aid the canal fund, and it will somewhat exceed $10,000,000, for the most extensive inland artificial navigation in the world, 414 miles. The total tolls on both canals last year, were $340,761, being within $62,042 of the whole present interest on the canal debt, which is only $402,803. The tolls of the year 1825, are expected to exceed $500,000. In May, they were about $100,000, and nearly as much in June. The best-informed citizens of the state calculate that in a very few years the revenue of the canals will amount to a million of dollars annually, and not only ultimately pay off the debt, but support the government. And let it be observed, that all the calculations heretofore made on the subject, have fallen short of the reality. The annual expenditure for repairs, improvements, and superintendance, is calculated at $100,000.

We trust that these favourable results would in themselves be abundantly sufficient to settle the question. But there are other points far more important in the eye of a statesman. Facility of access to market, affords such a stimulus to industry as, in many cases, by enhancing the price of produce, not merely to increase the value, but even to double and quadruple the quantity. "Lands too remote from market to tempt cul- "tivation—forests hitherto regarded as inaccessible—beds of "minerals or fossils unknown or neglected, will be brought "within the reach of ordinary enterprize, and rendered sub- "servient to the convenience and comfort of the citizens, or "to the defence and safety of the state."

"The improvements in the neighbourhood of the Erie canal, "are subjects of wonder and delight. Swamps have been "cleared—marshes drained—and cultivation extended where "human footsteps had never trod." On its banks petty hamlets have become handsome villages—villages have become

towns—and towns and villages are springing up, where, a few years since, there was no trace of a human habitation. Rochester, the chief town in Monroe county, by the census of 1820, contained 2062 inhabitants; by one held in 1823, 3731; and probably contains at present 4500. In 1812, there was not the semblance of a village there.

A lot of eleven feet front and forty feet deep, has been recently sold in that town for $1100—and a brick building erected on it, which rents for 340 dollars per annum.

The town of Lyons, which, five years ago, contained but two buildings, has now a court house, three places of worship, six inns, ten stores, and between 900 and 1000 inhabitants.

At the town of Palmyra, 360 miles from New York, there were 1500 cattle slaughtered in 1824. At the close of the present year there will have been 3000.

The New York ship builders are at present supplied with timber from Rochester and other places on the Canal. The tolls paid on two rafts, from Rochester to Albany, amounted to 367 dollars.

It is stated, on respectable authority, that the increased value of produce in the single county of Monroe, in the state of New York, in the year 1823, resulting wholly from the completion of the canal to that quarter, amounted to no less than $275,000. (See Note A.)

Ten thousand boats passed at the junction of the two canals in 1824. The attendants are employed day and night, and pass above forty in twenty-four hours; nevertheless there are always from sixty to seventy waiting. A second canal from Albany to Schenectady has become necessary, and will probably be undertaken at no very distant day.

The value of the produce received at Albany last year, through both canals, was about $3,000,000, and the quantity of merchandise probably an equal amount.

In the year 1821, there were but ten boats on the Champlain canal. The number was increased to above one hundred in 1823.

Among the advantages resulting from the Erie and Champlain Canals has been, the expenditure of about 9 or $10,000,000 among the farmers and other citizens of the state. Intense distress had prevailed in those quarters of the country for two or three years before the canals were commenced. The farmers were deeply in debt for their lands, and greatly embarrassed. The expenditure has completely relieved them, and produced a total change in their situation.

Another advantage, the extent of which it is difficult to calculate, is the enhancement of the value of lands. This enhancement in the state of New York, is probably beyond the whole expense of the two canals. (See Note B.) Tracts of

land contiguous thereto, have been recently rented for as much per acre, as they were a few years since offered for in fee simple without finding a purchaser. The advance of the value of the timber lands in the state of New Hampshire, by the completion of the Middlesex Canal, is estimated by competent judges, at $ 5,000,000; whereas the whole expense of the canal, 31 miles long, was only $ 700,000. Lands rose wherever there was convenient access to them, from one and a half and two dollars, to four, six, and eight dollars per acre.

In addition to these facts, we beg leave to state the very great advantages of conveyance by canal over that by even the best turnpikes; first, as regards the outfit; and secondly, as regards the expense of transportation, supposing wagons to proceed at the rate of 20 miles per day—and canal boats at the rate of 25. Some proceed at the rate of 40 and 50 miles.

The canal boats are usually calculated to contain 270 barrels of flour each, equal to about 25 tons, or an equal amount of other produce; which, conveyed on a turnpike, would require 11 wagons, and 55 horses. N. B. Some of the Erie canal boats carry 35 to 45 tons.

Outfit.

By Canal.		By Turnpike.	
Boat about	$250	11 wagons at $ 160	$1760
Horse	100	55 horses at $ 100	5500
Gears	15	55 sets of gears at $ 15	825
	365		8085

Here is an extraordinary difference in the outfit, the one twenty-two fold greater than the other; and there must be a continued onerous difference, arising from the support of the horses and the wear and tear of the wagons.

The difference in the expense of transportation is not quite in the same proportion. We state the result of the transportation of 270 barrels of flour for 300 miles, by canal and by turnpike.

By Canal.		*By Turnpike.*	
Two men and one boy 12 days at 87½ cents each	$ 31.50	55 horses 15 days at 87½ cents each	$ 721.60
One horse 12 days at 87½ cents	10.50	11 men 15 days at 87½ cents each	144.37½
	$ 42.00		
But as canals generally require greater circuits than roads, we will add one-third, thus allowing that where a turnpike road could be made of 300 miles, a canal to and from the same points would require 400	14.00		
	$ 56.00		$ 865.97½

In the above calculation, the boat and horse on one side, and the wagons, horses, &c. on the other, are presumed to belong to the owners of the respective freights. Supposing the freights to be transported by professed wagoners and boatmen, it would not materially vary the proportion.

We omit to notice the tolls on either side, as they are nearly equal on turnpikes and canals.

Thus the cost of transporting a barrel of flour, 400 miles, by canal, would be about twenty-one cents, exclusive of tolls—whereas by a turnpike, 300 miles, it would be 320 cents.* This expense would close the market against the article, and against all bulky articles of small comparative value, at the same distance, except in very extraordinary cases.

The flour, and wheat, (calculating five bushels of wheat to a barrel of flour,) transported on the Erie Canal last year, were 213,000 barrels. The canal, as we have stated, is 353 miles long; and supposing, for argument sake, that the average transportation of those articles was only 250 miles, the cost, at the above rate, exclusive of tolls, was about $36,000. Whereas had it been conveyed on a turnpike, (admitting the turnpike one-fourth shorter,) it would have cost above $566,000, exclusive of tolls. Thus the saving to the citizens, on the transportation of one single item, was greater than the actual interest on the entire debt contracted for the two canals.

We now enter on the consideration of the expense of the contemplated work, premising that it is impossible to form a perfectly accurate estimate, as the location is not fixed. Desirous of avoiding controversy, we will allow a wide scope for the most extravagant calculation, and there cannot be a doubt that it will amply repay whatever it may cost. In order to evince the facility with which it may be effected, we will assume, that to complete a canal *from Philadelphia to Pittsburg*, an expenditure of $ 8,000,000 will be necessary, (but we believe it $ 1,500,000 too much;) that this sum will be borrowed in yearly instalments, at five per cent. interest; and that eight years will be required to complete the canal.†

* This is higher than the present transportation from Pittsburg. But it must be observed, that the return freights are taken on very low terms, as otherwise the wagons would generally come down either empty or very partially loaded.

† If wooden locks be used,—(and there are strong arguments in their favour, as they last 14 or 15 years‡—cost but about 125 dollars per foot, instead of 1000—and can be repaired in winter, which stone locks cannot be,) the cost would not probably be more than $ 4,000,000 *from the Susquehanna to the Alleghany*, which is all that is necessary to provide for in the first instance—as the connexion between the former river and Philadelphia will be open long before the western part of the route is prepared. But we proceed on the supposition of an expenditure of $ 8,000,000.

‡ There is reason to believe that timber well saturated with lime water would last from twenty to thirty years in locks.

Interest, First year	$ 50,000
Second	100,000
Third	150,000
Fourth	200,000
Fifth	250,000
Sixth	300,000
Seventh	350,000
Eighth	400,000
	$ 1,800,000

This, supposing no tolls were to be collected, till the work were completed, is the whole sum to be raised in a state embracing 46,000 square miles, or 29,440,000 acres, with a population of 1,250,000 people, which will probably amount to 1,750,000 before the canal is finished—a state of which the assessment of real property in 1815, amounted to $ 346,633,389, and which, without material inconvenience or pressure, paid for internal duties in that year no less than $ 1,087,057. That any insuperable difficulty, or indeed any difficulty worthy of serious attention, could occur in raising the small sums necessary to pay the above interest in so powerful a state, wholly free from state taxes, will never be admitted by any rational mind. If the cost were double, the object is amply worth the sacrifice.

But the experience of the Erie canal satisfactorily proves that there will be a considerable income from our canal, not very long after its commencement. Take what direction it may, it will pass through regions abounding with coal and iron, and of course cannot fail to be very productive at an early stage of the operations on it. It is therefore probable that the only sums to be raised for paying the interest, will be in the four first years—as the tolls of the remaining four can scarcely fail to be amply adequate for that purpose. But suppose the tolls not to be sufficient until the commencement of the sixth year, the whole sum necessary to be raised, would be only $ 750,000 in five years, a sum which the smallest state in the union could readily raise by a proper system: and there cannot be a doubt, that within a few years after its completion, the income will not only afford means of establishing a sinking fund to pay off the debt, but revenue sufficient to support our state government, and free our citizens from the burden of taxation.

The influence of the proposed improvement on the sources from which the state derives its revenue, cannot but be immense. As the demand for merchandise increases, the auction duties will augment; as the retail sales of foreign articles increase, the number of licenses will be greater; as intercourse throughout the state becomes more extensive, and as Pennsylvania shall become, as she will by means of the connexion between the western states and the Atlantic markets,

being made through her centre, a thoroughfare for the citizens of those fertile regions; her receipts from tavern licenses will be multiplied many fold.

It may be asserted with confidence that the resources of the commonwealth from auction duties—from retail licenses—and from tavern licenses, will, before the work shall be completed, be twice their present amount, and will afterwards increase to three times the same.

In addition to these resources, let it be observed, that when we give the farmer of the interior a cheap and easy access to market, he will be enabled to pay the commonwealth for his unpatented lands; and thus, from this source alone, more than two millions of dollars, a sum greater than all that will be required to pay the interest of the debt which may be created to make the desired improvement, will be poured into the treasury, without oppression or inconvenience to the debtors.

It is asserted that the debt which must be contracted for this purpose cannot be paid off—that it will remain a burden on our posterity—and on this ground some opposition has been excited against the undertaking. It might be easily proved, that even if these positions were true, the benefits which would certainly flow from the work, would more than repay the expenditure for its execution. How many state undertakings, by their influence on the wealth, the industry, and the happiness of our citizens, have fully compensated the commonwealth for their cost, although they bring nothing into its coffers? Are the advantages of our turnpikes, and of our bridges, to be estimated by the revenue they produce? Should they, by some unexpected cause, be at once destroyed, would not the citizens of the state, if necessary, willingly expend twice their cost to restore them? It is not by the amount of revenue alone that the value of such works should be estimated. The farmer finds his possessions enhanced three-fold—industry finds a demand and a market for its productions by their facilitating intercourse: and yet but little pecuniary gain is derived by those who have created these benefits, or by the state, for the capital invested in the works by which they have been accomplished. Such have been the effects of turnpikes in Pennsylvania, and how much greater would be the effects of canals? Supposing for a moment, that the tolls were reduced so low, as to produce nothing more than the interest of the loans, and pay for attendance and repairs; the canal would, even at that low estimate, be abundantly worth the cost, independent of the numerous advantages which it must secure. It will be an invaluable bequest, which will entitle the legislature to which it shall owe its existence, to the lasting gra-

titude of posterity. But we are prepared by incontrovertible evidence to establish the fact, that the direct revenues which Pennsylvania will derive from the proposed work, will be far beyond the interest of any expenditure it will require; and we beg leave to repeat, it cannot be too often repeated, that they will not only repay in a few years all its cost, but become fruitful and ample means to support her government, without taxation, and to enable her to carry into every part of her territories, the same means of prosperity and wealth.

The average freights paid in Pittsburg, in 1815, 16, 17, and 18, were $ 1,000,000 per annum. In 1822, they fell to $ 700,000, the rates being much reduced. (See Note C.) The transportation of late has greatly increased—and, from the very best information, we are warranted in stating that at present the freights amount to $ 1,000,000. And in the event of the completion of the communication, the chief part of the goods which would otherwise take the route to Wheeling, would pass on the canal. The freightage from the west would be increased four or five fold, as the chief part of the cotton of Tennessee and North Alabama—the hemp and tobacco of Kentucky—and the potash, the flour, the corn, of the north-west of Pennsylvania and the eastern and southern sections of Ohio and Kentucky, would take this direction. The tonnage of the produce transported on the Champlain and Erie Canals is nearly five times as great as that of the merchandise passing westward towards Utica and Buffalo. The sales of merchandise would increase proportionably.

While we chearfully admit, and rejoice at, the manifold and important advantages which our sister state, New York, will deservedly reap for ages, from the liberality and perseverance which enabled her to complete her magnificent canals, we deem it but right to state the reasons on which we ground our belief, that our Pennsylvania Canal will be much more productive.

The Erie canal has hitherto been chiefly confined to the productions of the forest and of agriculture. The amount of gypsum, clay, iron castings, marble, burr and grindstones, which passed on it eastwardly last year, was only 9438 tons. The residue of the freights in that direction, viz. 119,014 tons, were, as we have stated, chiefly the productions of agriculture and the forest. In these productions we are equally blest with New York; and, in addition, we may count largely on our coal and iron, which, wherever they are found near to canals, afford them their chief support. In these we abound to an extent not exceeded in any other country in the world. The tolls on them alone would probably be sufficient to pay the interest on the capital invested. Of the former, none, we believe, has yet been discovered in New York—and the supplies of the latter appear

to be limited, compared with the superabundant quantities scattered through our state. The tolls on those articles will probably be double those on agricultural productions. In other mineral treasures we are highly blest. Salt, to an extent equal to the quantity produced in New York, we have the capacity of furnishing. It is to be found almost every where near the western waters of the state. There is, moreover, a much greater portion of the population of the western states likely to avail themselves of our canal than of the Erie Canal. (See Note D.) And we shall derive very important advantages from the circumstance, that the navigation of Lake Erie is generally, if not always, open at Erie Harbour, three weeks earlier in spring, and as much later in autumn, than at Buffalo or Black Rock. (See Note E.) These are the periods when it is all-important to the country merchants to procure their supplies for the two great seasons of trade. Again: Philadelphia is about 111 miles nearer to Erie harbour than New York. (See Note F.) That harbour, when the improvements are completed, which are now in successful progress, and for nearly the whole of which appropriations are made by the general government and that of Pennsylvania, will be beyond all comparison the best and safest on the lake. In fact, it may be said that it will then be *the only safe harbour on that inland sea.*

Statements have been made of the dividends on canal stocks in Great Britain, to depreciate the importance of canals, and to prove that they are not so lucrative as is generally assumed. The whole number of canals in Great Britain, exclusive of those below five miles in length, is 102, of which 80 are summed up together, on which the dividends are stated to average $5\frac{3}{4}$ per cent. This is by no means a correct procedure. While many of those canals are highly profitable, in consequence of a proper location, several, on the contrary, are wholly unprofitable, having been constructed in a most prodigal manner—some located in situations where the traffic did not require them—and some so destitute of adequate supplies of water, as to be little better than dry ditches. It must be obvious, therefore, that such an amalgamation affords no correct criterion of the pecuniary remuneration of canals. Even with this very great disadvantage, however, the average dividend, as above stated, is an adequate one, and far above the actual interest of money in Great Britain. And it is a point universally conceded, that much of the prosperity of Great Britain has arisen from the facilities of intercourse afforded by her canals. In fact, it may be assumed as a maxim, to which there is scarcely an exception in the world, that every canal, judiciously located, honestly

constructed, and where there is a sufficient supply of water, and abundant traffic, yields as handsome a dividend as could be reasonably desired, and as almost any other investment whatever, and indeed far beyond most others. There are fifteen canals in Great Britain, of which a single share in each cost £ 1525, whereas the prices in June, 1825, were £ 13,823. The aggregate of the dividends was £ 575, equal to 37 per cent. (See Note H.) The failure of 50 or 500 canals injudiciously located, or too expensively constructed, could not outweigh the complete success of these fifteen, which were justified by local circumstances.*

* The Regent's Canal, of eight miles, cost £ 700,000, [$ 3,150,000.] The Thames and Severn, most injudiciously located, and wholly unnecessary, cost £ 255,000, [$ 1,147,500.] The former appears to make no dividend. The shares of the latter were £ 100, and are now only £ 30. Can any inference be drawn against canals generally, from the result of the folly displayed in these and similar undertakings? The Grand Junction Canal, with its branches, is only 147 miles, and cost £ 2,000,000, [$ 9,000,000.] Notwithstanding this enormous expense, above $ 61,000 per mile, it is so very profitable, in consequence of its being judiciously located, that the shares are at an advance of above 200 per cent. In the European Magazine, of June last, they are quoted at £ 338 per share. The main canal has one hundred and one locks, being more than one for every mile.

But the consideration of the dividends on the stock, or the remuneration for the capital invested, which, with private individuals, might very properly be regarded as a paramount object, sinks into insignificance, when compared with the vast increase of happiness and prosperity which such works produce. It may be averred, without danger of error, that had the New York canals cost $ 20,000,000 instead of $ 10,000,000, it would have been as prudent an investment of capital as has ever been made in this country since the days of Columbus. Indeed, had the whole amount been raised by taxes, provided they were judiciously imposed, the investment would be warranted. For every dollar the citizens paid, they would in the course of a few years be reimbursed ten.

Our two wars fully displayed the ruinous consequences of the want of canal communication. Judge Peters, who, during that of the revolution, acted in the war department, has recently stated, that—

"At one time, when the main army subsisted, during ten or twelve days, "on Indian corn alone, there was a sufficient quantity of provisions, both "meat and flour, not only to prevent want, but to afford plenty and every "comfort. They could not, with unremitting efforts, transport the supplies "from distant magazines where they were collected. This," he adds, "is not "a solitary instance; for I have known it occur in many others. I have "known brigades of wagons, sent to distant magazines, so long delayed, by "impracticable roads, impassable streams, and other impediments, that the "attendants and the horses consumed the greater part of full ladings, before "they could reach our camp."

The transportation of one hundred pieces of cannon from Frenchtown to Newcastle, 18 miles, during the late war, cost $ 4551—and, in the wretched state of the roads, probably required fifteen or twenty days—whereas it would not have cost more than $ 100, and required only one or two days, had there been a canal in that quarter. Delays such as these might produce losses equal to the expense of a canal, and even endanger the safety of a state. The extra expense of transportation during the late war, through the want of canal communication, would have cut canals from Boston Bay to South Carolina. The transportation of cannon which cost $ 400 at the foundery, amounted to 3 and

"Let us contemplate the immediate effects of the execution "of this work. Throughout the fertile districts of our com- "monwealth," wherever the course of the canal may be located, many "*millions of dollars* will be expended. While the work is "in progress, and until it shall be completed, the farmer resid- "ing within fifty miles of any part of its route, will find a mar- "ket for the produce of his farm, and profitable employ- "ment for his oxen and his horses. More than six thou- "sand persons will be engaged in excavating the earth—in "making locks—in building bridges and aqueducts, and in "removing obstructions from and improving the beds of the "rivers. Mechanics of all descriptions will be enriched by "the large sums of money, which will be distributed among "them for the various operations they will be called upon to "perform. Unlike the expenditures for war, or the investment "of capital in adventures to distant countries, for the pur- "chase of the manufactures of foreign hands; the expendi- "tures for this home undertaking, will be distributed among "ourselves; thus fostering and rewarding our own industry, "and promoting the prosperity of our own citizens. Ani- "mating the whole country by its influence, the money which "will be paid away, will still be retained among us. Like the "seed, which 'fell upon good ground,' 'it will bring forth "an hundred fold.'

"As soon as the canal is completed, then will commence "the era of general and extensive prosperity, among all those "who shall make use of the facilities and advantages it will "afford. From every part of the western section of the com- "monwealth, the productions of the field, the forest, and of "the mineral kingdom, will be sent to a sure and profitable "market."

To the arguments derived from the increase of the wealth, the prosperity, and the population of the state, which must necessarily flow from opening this communication, must be added those that are to be drawn from the pernicious consequences of remaining stationary on this grand point, while our neighbours are advancing with such rapidity. Notwithstanding the great advantages this state enjoys, second, we repeat, to none in the union, the progress of settlement has been slow compared with that of New York, whose population, in 1800, only 586,050, rose, in 1820, to 1,372,812, being an increase of 133 per cent. Our population in 1800, was 602,548

$4000. Pork has cost government $120 per barrel. The transportation of flour has cost in some instances 40 or 50 dollars per barrel. Mr. Benton, member of the United States senate from Missouri, stated on the 24th of February last, that "sixteen millions of dollars had been expended during the late war, on transportation over roads so abominable as to make the cannon balls cost a dollar a pound."

—in 1820, it was but 1,049,458, being an increase of only 70 per cent. The disproportion will probably be greater at the next census—and *unless we open adequate markets for the citizens of the interior, they will gradually migrate to a state where they can reach a market at the distance of* 500 *miles, at a third part of the expense to which our farmers are subject at a distance of* 250 *or* 300 *miles.* It is now a question whether we shall allow our state to be drained of its wealth, to increase that of a neighbour already advanced to a towering height, or whether we will make adequate exertions to secure to ourselves the abundant resources with which we have been blest by nature.

The spirit of internal improvement is generally spreading throughout the Union, and the most active preparations are making in various states for cutting canals and improving the navigation of rivers. Want of room prevents us from entering into detail on the subject. We shall therefore confine ourselves chiefly to Indiana, Illinois and Ohio. The two first, among the youngest of the family of states, have made arrangements for cutting a canal to open a communication between the Maumee river and the Wabash, which will open to them a connexion with lake Erie. The state of Illinois has actually incorporated a company for cutting a canal of about one hundred miles in length, to connect the waters of lake Michigan with those of the Illinois river, and thus secure a communication between the former and the Mississippi. The population of this state in 1820, was only 55,211, and yet she boldly undertakes two canals at the same time, about one-third of the extent of the canal necessary for a communication between Philadelphia and Pittsburg--a canal which many of our citizens represent as too arduous an undertaking!!! The state of Ohio, just emerging from the multifarious distresses and embarrassments of a depreciated paper currency, stop laws, &c. &c. &c. has, with a most laudable zeal and energy, already commenced two canals, one of about 320 miles to connect Lake Erie and the river Ohio; the other, about 60 miles, to open a communication between Cincinnati and Dayton. These magnificent enterprises she has wisely undertaken at the expense and for the advantage of the state. We hope that these examples, particularly the illustrious one of Ohio, will stimulate this powerful state to make adequate exertions, so as not to be distanced by her younger sisters. In 1800, when the population of Pennsylvania was above 600,000 souls, the above three states contained only 51,006. Let us add that the state of Virginia has established a permanent fund for internal improvements, of $1,368,960, whereof $1,241,200 is in Bank stock.

It were to display an utter ignorance of human nature and of experience, to suppose that such an important measure, as the one now contemplated, how pregnant soever with immense advantages, could be carried into effect without opposition. Scarcely any great measure was ever proposed in any country, that did not meet with formidable opposition, which is too frequently powerful in proportion to the utility of the object. When turnpikes were first introduced into England, there was an outrageous clamour excited against them, (See Note G.) and they became so unpopular, that the populace destroyed in the night what had been done during the day.* During the French revolution, the government attempted to introduce turnpike roads in France—but the measure met with such opposition that the directory was obliged to abandon the undertaking.†

But we need not go to Great Britain or France for examples. Our state has furnished a striking case in point. The Lancaster turnpike, the first executed in the United States, was extremely unpopular with, and at its commencement met with violent opposition from, those persons situated on, or near, the old road. New York also furnishes a strong case. The opposition to her canals was as ardent and violent, as if the ruin of the state had been connected with them. It was asserted that they were the result of folly and madness—and predicted that they would involve the state in inextricable difficulties —and finally prove nothing but great dry ditches. The fallacy of these predictions, fellow citizens, and the errors of this opposition, ought to be borne in remembrance, as a guard against the influence of similar predictions, now hazarded with equal confidence, and similar opposition which will ultimately be found to have been predicated on unwarranted prejudices. The more zealous and ardent the opposition, the more energy ought to be employed by the friends of the proposed measure. Never were zeal and ardour employed on a more important object, and never were apathy and indifference more culpable.

The great evil to be guarded against in this magnificent undertaking, is the prevalence of local interests and jealousies, which, if allowed free scope, will destroy all our hopes. Some of those who are not to be immediately benefited by the location of the canal, regardless of its immense advantages to the state at large, will be arrayed in opposition to it. Already we find this spirit making its appearance, but we hope confined to a few. Preferences for particular routes will prevail—tend to produce embarrassment—and must be op-

* Dupin's Commercial Power of Great Britain, Vol. I. page 47. † Idem.

posed by all the sincere friends of the public welfare. We ought all to be prepared to support, with heart and hand, the decision of the respectable board of commissioners, founded on the surveys and report of a competent board of engineers. If we cannot rely on this decision, on what can we place reliance?

In making these statements, we are aware that alarm may be given to existing interests. The proprietors of the great turnpike roads, which lead from one extreme of the state to the other, may be led to imagine, that the establishment of a cheaper mode of transportation will take away their custom; and those who are profitably engaged in the conveyance of produce and merchandise by wagons, may suppose that it will materially interfere with, if not wholly destroy, their occupation. If this alarm were well grounded, and the effects here alluded to were such as must inevitably follow, however much we might lament the destruction of capital, and the injury to individuals, yet we could by no means admit that the progress of improvement should be arrested by such considerations. The turnpikes themselves might have been resisted on similar grounds. In many instances they changed the route, to the great prejudice of those who lived along the road; and in every instance they expedited the transportation of passengers and goods, so as to lessen the time employed in passing, and of course to diminish the demand for subsistence during the passage. Even the roads which preceded the turnpikes, rude as they were, destroyed the transportation by packhorses. And the turnpikes, in the progress of change, have been obliged to submit to the injury inflicted by rival roads, laid out parallel to their course, sometimes throughout the whole extent. The truth is, that there is no conceivable state of things, however adverse to the public interest and prosperity, that may not be advantageous to particular persons; and there is no great improvement, however confessedly beneficial to the public, that may not at least appear to prejudice the interests of individuals. Steam-boats, at their first introduction, encountered the most violent opposition from the owners of sloops and packets. It is stated, on apparently good authority, that the first steam-boat that navigated the Mississippi, was actually burned by some of the barge-men, who anticipated their ruin from the success of steam-boats. The result has proved the folly of the prejudice that prevailed. There are twenty times as many persons employed now in navigating the Mississippi as formerly. Great undertakings are frequently opposed with violence from unfounded prejudice, even without the interposition of sinister motives. The water works, that noble effort of talent and energy, whereby

Philadelphia is supplied with pure and wholesome water to an extent not exceeded in the world, and which are likely to yield an income that will in a few years furnish an adequate sinking fund to discharge the entire debt contracted in their establishment, and afterwards to defray a great portion of the city expenses; were violently opposed at the commencement, and declared to be a visionary, impracticable, and burdensome scheme.

But the efforts of intelligence and patriotism to improve the condition of a community, cannot be discouraged or checked by restraints like these. Mind is every where engaged with ceaseless activity in promoting industry, and facilitating intercourse. Space, and every seeming natural difficulty, are yielding to the spirit of improvement, which is bounded in its indulgence by no law but that of the public welfare. Individual and private interests, though always entitled to regard, must give way to the paramount consideration of the great interests of the commonwealth.

With this answer we might remain content. But we are much more gratified to be able to say, as we can do with entire confidence, that such apprehensions are not well founded. Among the most strenuous opposers of the Erie Canal were the proprietors of the great western turnpike, from Albany to Buffalo, who augured nothing less than the destruction of their property from this measure. The event has proved how grossly they were mistaken. The travelling has greatly increased—five times as many stages are run on the road—the heavy wagons which used to destroy it, have nearly all disappeared—the repairs are greatly diminished—and the dividends increased in the same proportion. Whatever gives activity to commercial intercourse, must multiply the use of roads. Neither can we believe that transportation by wagons, though its direction may be changed, will suffer diminution. Produce will be hauled to the canal, at different points, and it can be hauled from great distances. Such a communication, in its effects, is like a great navigable river, accessible throughout its whole course, and to which every avenue tends. It creates activity, instead of destroying it.

If, however, these apprehensions were better founded than they are, what would be the rational conclusion to be derived from them? It is no longer a question, whether transportation from west to east, and from east to west, shall be by turnpike roads and wagons. That is already decided. The great rivers of the west are offering the most inviting facilities to a communication with the ocean by the south. On the north, the magnificent production of New York intelligence and enterprise presents a navigable connexion with

the east. On our southern border, a new avenue is to be opened by the Ohio and Potomac. *It is not a question, therefore, whether Pennsylvania shall transfer the carriage from turnpike roads to a canal of her own, but the real question—and a most solemn one it must undoubtedly be deemed—is, whether Pennsylvania shall lose the carriage altogether?*

If in the amicable, and not unworthy rivalship that is to be maintained, Pennsylvania cannot approach nearer to the efforts of her neighbours than by roads and wagons, we pronounce distinctly that she cannot support the competition, and must yield up a large portion of her immense natural advantages to those enterprising neighbours.

It has been said, that this work, like the Union canal and the Schuylkill navigation, ought to be undertaken at the expense and risk of individuals. To this there are two strong objections. First. It is more than probable, that individual enterprise and capital, commensurate with such an undertaking, could not be commanded. Secondly. The advantages are too numerous and important, to be surrendered into the hands of any individuals. How calamitous would it not be to the state of New York, had she been so far misguided as to allow her canals to be executed by companies, who would monopolize their benefits in perpetuity! We trust Pennsylvania will never commit an error so hopeless of remedy. We trust she will never part with the sovereignty she holds over her majestic rivers, nor cede to any corporation, however guarded by legislative provisions, the power and right over the great means of intercourse between the east and the west, and between the north and the south. As state works, accomplished by state means, regulated by state laws, and interwoven with state interests, they will be the pride and boast of every Pennsylvanian. As links of a chain of adamant they will bind every part of the commonwealth together; and as the common property of all, they will create and strengthen kindred feelings, and make our citizens a band of brothers, with no other rivalship than that which honest industry and enlightened patriotism will approve, with no other objects but the common good of all. Surrender to others the right to execute such works for individual emolument, and all these rich and grateful anticipations will be lost, and the means to attain them will be gone for ever.

In this address we have cautiously forborne to touch on rail roads as a medium of opening the proposed communication; not by any means because we are hostile to them, but because our information on the subject is not sufficiently matured to warrant us in forming a decisive opinion. From the various accounts published, in support of them in England,

by their friends, they appear to have important advantages. Their advocates are so sanguine as to believe that they may ultimately supersede canals altogether. This is certainly very doubtful. Should they, however, be found, on a fair trial, to realize the anticipations formed of them, we hope and trust, they will be preferred to canals, and none of our citizens will be more eager to secure that preference than those who now address you. It cannot be denied, if they prevent the necessity of the expensive and tedious operation of tunnelling, as their advocates assert, that they may be eminently serviceable as subsidiary to canals, in surmounting elevated regions where there is a scarcity of water.

We venture to suggest the following observations to the consideration of the public. There are, we apprehend, certain portions of the space on each side of the mountains, which are calculated for all the locations of the route which are contemplated. Arrangements might be made for commencing with these at once, as soon as surveys are made. We should thus gain time, and greatly accelerate the progress of this most important undertaking.

In reflecting on this grand subject, it ought to be borne in mind, that it is a work not merely for the present generation, but for remote posterity; that the canal will offer a direct communication with the whole of the countries watered by the magnificent lakes and rivers of the west; that there is at present a steam-boat and keel-boat navigation* in that section of the United States, of 20,000 miles; that its population more than doubles every ten years; for in 1820 it was 2,233,535 souls, whereas in 1810, it was only 1,022,604; that it scarcely contains less than 3,200,000 at present, and will probably contain above 4,000,000 in 1830; that a large portion of it nearly trebles its numbers in ten years; for the population of Alabama, Mississippi, Louisiana, Tennessee, Ohio, Indiana, Illinois, Missouri, Michigan and Arkansas, in 1810, was only 616,093, whereas in 1820, it was 1,669,336!!† that the steam-boats, which will transport the produce of a large por-

* There are on the United States' side of Lake Erie at present 56 vessels navigated by sails, of which the tonnage is about 2300 tons. They make about 25 trips in the year, generally fully loaded, so that their cargoes may amount to above 50,000 tons, but say only 40,000. The steam vessels, built and building, are five, of which the tonnage averages 210 tons. They will make about 50 trips in the year. If they carry only half cargoes, they will amount to about 25,000 tons annually. This will make an aggregate of 65,000 tons, which will be constantly and rapidly increasing, probably trebling or quadrupling in four or five years.

† Alabama and Mississippi, in 1800, contained 8,856 inhabitants, in 1820, 219,756;—Tennessee, in 1800, 105,602; in 1820, 422,613;—Ohio, in 1800, 45,365; in 1820, 581,434; Louisiana, in 1810, 20,845; in 1820, 153,407;—Indiana and Illinois, in 1810, 36,801; in 1820, 202,389. What stupendous views these facts open for reflexion!

tion of those countries to Pittsburg, stem the current of the rivers at the rate of 150 miles per day; and that such are the advantages of this important section of our country, such the fertility of its soil, and such the increase of its population and cultivation, that at no distant day it cannot fail to afford full employment for the New York, the Pennsylvania, and the Potomac and Ohio canals. The mind can hardly grasp the extent of the advantages which thus court our acceptance, and the splendor of the prospects which open to our view.

In the compass of an address, it cannot be allowed us to present for your consideration and estimate, all the advantages which will flow from the completion of a communication between the eastern waters and the Ohio and Lake Erie; nor could we expect your attention, were we to endeavour to answer every objection which might be stated to the undertaking. Some of the most prominent arguments in its favour, and a limited exhibition of the large benefits to be derived from it, we have represented to you; a few of the difficulties which have been alleged as interfering with its execution, we have attempted to remove or diminish. But it would be an imperfect execution of the honourable trust assigned to us by the Convention, were we to pass over two considerations, the influence of which we know is extensive with some of our most respectable fellow citizens. It is asserted that when a communication between the east and the west shall be made in the manner proposed, the markets of the Atlantic capitals will be glutted with the productions of agriculture; and, it is also said, that the value of property in the neighbourhood of those capitals will be lessened, as the most distant regions will have a cheap access to them, and thus furnish those supplies, at a rate much lower than they can be afforded by those who have paid high prices for their farms, and expended large sums in the buildings erected on them.

The answers to the first objection have been furnished by experience, and are obtained from the soundest principles of political economy. Consumption will always be, and has always been, in proportion to supply. As the quantity of the necessaries and comforts of human life is increased, population has always increased, and will increase. Industry is promoted by plenty; new wants are created by it; and the means to gratify these wants are obtained by augmented exertions. Such has been the effect of internal improvements upon all the large cities in England, Scotland and Wales. It has been found in every one of them, that the number of their inhabitants has in most instances doubled, and in that of two or three has more than trebled since the introduc-

tion of turnpikes and canals. We must be allowed to refer to some facts in support of these positions. Manchester in England, in 1773 contained 27,246 inhabitants; in 1824 it contained 163,888. Liverpool in 1760, before the Bridgewater Canal was executed, contained 25,787 inhabitants; in 1824 it contained 135,000. London in 1801 contained 900,000 souls; in 1821, its population was 1,225,963. Are we required, after these facts and the observations which precede them, to enter into reasoning for the purpose of proving that the lands in the neighbourhood of capitals, will not be lessened in value by increasing the facilities of access to them? There will always be in large cities a constant demand for the productions of the neighbouring country, many of which cannot be supplied from a distance. The early bounties of spring, the gifts of the dairy, fruits and vegetables, hay and grass, will always be exclusively obtained from farms within short distances from the places of demand. Thus, therefore, the augmented population of the towns, will still secure and preserve to the neighbouring farmer the benefits he now enjoys from being in their vicinity, and will make him an equal participator in the rich results of the execution of the great state work we seek to have accomplished.

We regret the length of this address—and yet are obliged to omit many strong facts and cogent arguments in favour of an important measure, the success or failure of which cannot but produce most important consequences on the welfare and prosperity of our state, and greatly decide its future relative standing among its sisters, and in the world at large. We now submit the whole subject to the good sense and public spirit of Pennsylvania, fully satisfied that if that sense and spirit be called into activity, in any degree proportioned to the magnitude of the object in view, they cannot fail to produce a most felicitous result, and lead to scenes of prosperity and happiness, never exceeded in the annals of nations.

MATHEW CAREY, of Philadelphia, Chairman,
JOHN KENNEDY, of Fayette County,
S. D. INGHAM, of Bucks County,
JACOB HOLGATE, of Philadelphia County,
JOSEPH PATTERSON, of Alleghany County,
PHILIP S. MARKLEY, of Montgomery County,
THOMAS H. SILL, of Erie County,
JOHN FORSTER, of Dauphin County,
THOMAS H. BAIRD, of Washington County,
} *Committee.*

August 22, 1825.

NOTES.

NOTE A.

Statement showing the amount of profits to the county of Monroe, New York, arising from canal navigation, during the year ending Nov. 1823, extracted from a report of the Ohio Canal Commissioners.

"494,000 bushels of wheat were manufactured at the Roches-		
"ter mills during the year, which, previous to the comple-		
"tion of the Erie canal to that place, was worth but 50		
"cents per bushel - - - - -	$247,000	
"Average value of wheat at Rochester in 1823, 94 cents per		
"bushel - - - - - -	464,360	$
		217,360
"20,000 tons of merchandise brought up, at a saving, in consequence		
"of canal navigation, of $ 24 per ton - - - -		48,000
"Property not marketable heretofore, viz. staves, heading, tanner's		
"bark, plaster, rails, posts, &c. - - - -		10,000
"Total - - - - - - - -		$ 275,360

Note B.

We submit the following estimate from Mr. Clarke's report on the Juniata Canal, as to the enhancement of the value of lands by the completion of the canal to Pittsburg. That it is too highly coloured and flattering, we admit—but reducing it one-half, three-fourths, or even seven-eighths, which we believe a far greater reduction than is necessary, it fully proves that this one item alone would warrant the expense of the canal, independent of its other numerous and important advantages.

"Let us suppose five concentric circles, the innermost of which to pass "round Pittsburg at thirty miles distance, and having the lands within it raised in value only $ 2 50 per acre, and each succeeding circle at the same "distance from the one within it, having a less increase on the value of its "lands by fifty cents per acre, which would leave the outermost circle within "the supposed influence of the canal, only benefited at the rate of fifty cents "per acre. The calculation would then stand thus:—

Circles.	Square miles.	No. of acres.	Enhanced value per acre.	Dollars.
"1st	21,721½	13,901,760	at $ 0 50	6,950,880
"2d	18,894½	12,092,480	1 00	12,092,480
"3d	16,067½	10,283,200	1 50	15,424,800
"4th	13,240½	8,473,920	2 00	16,947,840
"5th	10,413½	6,664,640	2 50	16,661,600
Total	80,337½	51,416,000		$ 68,077,600"

NOTE C.

Extract from a report to the house of representatives of the state of Pennsylvania, dated December 24, 1822.

"To such an extent had the carrying trade arrived in consequence of the "demands of the increasing population of the western country, that the aver- "age annual amount of carriage money, paid to wagoners at Pittsburg alone, "in the years 1816, 17, 18, and 19, exceeded $ 1,000,000, almost every dollar "of which was drawn from the western states, and retained in Pensylvania.

"The carriage of the outer lading at this period, [1822,] costs about $ 600,- "000, and the inward about $ 100,000—the price of carriage being very low

"at this time." Since that period, the inward carriage has increased probably three-fold.

NOTE D.

The following statement, which we believe substantially correct, has been recently published:—

"Population of the western country, probably depending for supplies

"On New York,		"On Philadelphia,	
"Half of Ohio	350,000	"Half of Ohio	350,000
"Part of Indiana	20,000	"Half of Kentucky	300,000
"Part of Illinois	10,000	"Part of Indiana	150,000
"Michigan and North West "Territory	17,000	"Part of Illinois	50,000
"Part of British possessions	13,000	"Missouri	70,000
		"North-west section of Virginia	100,000
	410,000		1,020,000"

NOTE E.

"The subscribers, from their knowledge and observation of the trade and "business of the harbour of Erie, and of Buffalo, and of the operation of ice "at each of those places, believe it may be fairly estimated, that the average "length of time that the harbour of Erie, and that part of the lake immedi-"ately above that place, is open and free from ice, before the harbour of Buffalo "is open, is three weeks. Some of us have had opportunities of making obser-"vations on this subject for more than twenty years.

"JUDAH COLT,
"THOMAS FORSTER,
"P. S. V. HAMOT,
"RUFUS S. REED,
"JOHN F. WRIGHT,
"GEORGE MILES, Jun.
"J. KELLOGG,
"DANIEL DOBBINS.

"*Erie, Pa. July* 29, 1825."

NOTE F.

Statement of the distance of New York and Philadelphia from Erie Harbour.

	Miles.		Miles.
"From Erie to Buffalo	90	"Pennsylvania route to Pitts-"burg, as examined by the "United States' Engineers	379
"From Buffalo to Albany by canal	353	"From Pittsburg to Erie	113
"From Albany to New York	160		492
	603	"Difference	111
			603"

NOTE G.

"When a bill was brought into the British parliament fifty years ago, to "establish turnpike roads throughout the kingdom, the inhabitants for forty "miles round London petitioned against such roads; their arguments were, "that good roads would enable the farmers of the interior country to bring "their produce to the London market cheaper than they who lived nearer "the city, and paid higher rent; that the market would be overstocked, the "prices diminished, and they unable to pay their rent, or obtain a living. The "good sense of parliament, however, prevailed; the roads were made, the "population and commerce of London increased, the demand for produce in-"creased, and he who lived nearest to London still had a superior advantage "in the market." *Fulton's letter to Mr. Gallatin.*

NOTE H.

Statement of Canals in England, with the original cost of the stock of each, its present price, and yearly dividend, June, 1825.

Names of canals.	Original cost of each share.	Present price of each share.	Annual divid'nd on each share.
Birmingham	£25	£340	£12.10*s.*
Chesterfield,	100	120	6.10*s.*
Coventry	100	1200	44
Erewash	100	1000*	58
Grand Junction	100	338	10
Leeds & Liverpool	100	540	15
Leicester	100	380	14
Oxford	100	800	32
Stafford & Worcester	100	900	40
Trent & Mersey	200	2100	75
Warwick & Birmingham	100	300	11
Warwick & Napton	100	260	11
Loughborough	100	4300	200
Melton Mowbray	100	245	11
Mersey & Irwell	100	1000	35
	1525	13,823	575

From the above it appears that canal stocks in England of the medium original cost of £1525, pay a medium dividend of £575, exceeding 37 per cent. per annum, and are now worth £13,823—more than eight times their original cost.

The following are the resolutions agreed to by the Harrisburg Convention, at its sessions of August 5th and 6th, 1825.

WHEREAS, the great interests of the State of Pennsylvania require that there should be a steady perseverance in improving the resources of wealth, and strength, and social comfort, which abound within her limits: *And whereas,* the time has arrived when she is called upon by every consideration of regard for her character and standing, as well as for her permanent prosperity and happiness, to make a vigorous and united exertion for accomplishing, without delay, the connexion of the Eastern and Western Waters: *And whereas* a distinct and solemn expression of the deliberate opinion of the people is always of powerful efficacy, and is especially fit and requisite upon an occasion like the present, where an extraordinary effort is necessary for the common advantage of the whole, the public will being the only sure authority for the undertaking, and the best pledge for its energetic and zealous prosecution: *Therefore,*

1. *Resolved,* That the improvement of the Commonwealth will be best promoted, and the foundations of her prosperity and happiness most securely established, by opening an entire and complete communication from the Susquehanna to the Alleghany and Ohio, and from the Alleghany to Lake Erie, by the nearest and best practicable route, and that such a work is indispensably necessary to maintain the character and standing of the state, and to preserve her strength and resources.

* In the price current from which this list is taken, there is a blank for the price of the shares in the Erewash Canal. This blank is filled up from a former price current, and the rate is very low, considering the high dividend of 58 per cent.

2. *Resolved*, That the application of the resources of the state to this undertaking, ought not to be regarded as an expenditure, but as a most beneficial investment; for its successful execution will increase the public wealth, improve the public revenue, and greatly enlarge the ability of the state to extend her aid to every quarter where it may be wanted; and at the same time will encourage industry, create circulation, extend trade and commerce, enhance the value of land and of agricultural and mineral products, and thereby augment the means of the citizen to promote his own and the public welfare, by contributions to similar works.

3. *Resolved*, That all local objects tending to a diffusive and unconnected application of the public means, ought, for the present, to yield, so as to allow an undivided exertion of the public strength in this great undertaking, which is essential to its speedy and successful prosecution. For though it be certain, that whatever may be its location, the benefit will be most sensibly felt, in the first instance, in the immediate neighbourhood, yet it is also true, that its invigorating influence will pervade every part of the Commonwealth, and, in a short time, its branches will spread in all directions wherever the bounty of Providence has furnished the means of access to the great channel thus improved; and, encouraged by this example, new channels will be successively opened as occasion may offer, or the public exigencies and the demands of the country may require.

4. *Resolved*, That in our opinion, the people of Pennsylvania will fully sustain the Legislature in all such measures as may be necessary for effectuating this highly important and interesting object; as we believe them to be fully sensible of its political and social value, and they have never refused to support, to the utmost of their ability, what their enlightened and patriotic judgment approved as fit to be done for the common good.

5. *Resolved*, That this convention regards with satisfaction, the efforts which have heretofore been made and are still making, under the authority of this Commonwealth, to improve the navigation of the river Susquehanna, and of the other great rivers of Pennsylvania.

6. *Resolved*, That we regard with satisfaction, the efforts of our sister states, to make extended improvements, and that, in our opinion, a wise and liberal policy requires of Pennsylvania, to grant to them every just and legal facility wherever her concurrence may be necessary to their successful prosecution; and that we have witnessed, with pleasure, the progress made towards laying out a canal from the Potomac to the Ohio, as well as the steps taken by the state of New York, for forming a connexion with the north branch of the Susquehanna.

7. *Resolved*, That Messrs. Carey, Kennedy, Ingham, Holgate, Patterson, Markley, Sill, Forster and Baird, be a committe of correspondence, and that they be requested to prepare an address to the people of Pennsylvania, upon the subject of internal improvements.

The following are the votes on the sixth resolution.

YEAS.		YEAS.	
Messrs. John Dickson,	*Adams County.*	Samuel D. Ingham,	*Bucks County.*
Samuel Sloan,		William Carr,	
Ephraim Pentland,	*Alleghany County.*	John W. Wynkoop,	
Joseph Patterson,		Mathias Morris,	
Matthew B. Lowrie,		Henry Chapman,	
Harmer Denny,		John Gilmore,	*Butler County.*
Thomas Blair,	*Armstrong County.*	John Bredin,	
*John Tod,	*Bedford County.*	Moses Canan,	*Cambria County.*
*James M. Russel,		Thomas Burnside,	*Centre and Clearfield.*
Lewis Reese,	*Berks County.*	Francis W. Rawle,	
Nathaniel P. Hobart,		David Townsend,	*Chester County.*
Isaac Heister,		Joseph Sharp,	
Peter Eckhart,		Joshua Evans,	
*Edward Herrick,	*Bradford County.*	Joshua Hunt,	

YEAS.

Daniel Montgomery, Christian Brobst, John M'Reynolds, — *Columbia County.*
John B. Wallace, Arthur Cullum, — *Crawford County.*
*Robert M'Coy, *Jacob Alter, *Henry Vethake, — *Cumberland County.*
John Forster, Silas Marsh, — *Dauphin County.*
George G. Leiper, Thomas Smith, — *Delaware County.*
Thomas H. Sill, Giles Sanford, James Todd, Samuel Evans, Thomas Irwin, John Kennedy, — *Fayette County.*
*Robert Smith, *Thomas H. Crawford, *George Chambers, — *Franklin County.*
William S. Harvey, Robert Whitehill, — *Greene County.*
John Scott, John Blair, — *Huntingdon County.*
*Nathaniel H. Loring, Joseph Barnett, — *Lebanon County.*
*Henry King, *Stephen Balliet, *Jonas Rodrock, — *Lehigh County.*
Jacob Cist, Nathan Beach, — *Luzerne County.*
Robert M'Clure, Andrew D. Hepburn, — *Lycoming County.*
Thos. S. Cunningham, *Mercer Co.*
David Crawford, *Mifflin County.*
Levi Pawling, Philip S. Markley, Thomas Baird, Jacob Dewees, — *Montgomery County.*

YEAS.

*James M. Porter, *William Brodhead, — *Northampton County.*
Lewis Dewart, William Tweed, — *Northumberland County.*
Abraham Addams.
John Sergeant, Manuel Eyre, Charles J. Ingersoll, William Lehman, Mathew Carey, William J. Duane, — *Philadelphia City.*
Jacob Holgate, James A. Mahany, Joel B. Sutherland, George W. Riter, Samuel Breck, James Ronaldson, Samuel Humphreys, — *Philadelphia County.*
Jonathan Colegrove, — *Potter and M'Kean.*
Thomas S. Ridgway, *Schuylkill.*
John Gebhart, Abraham Morrison, — *Somerset County.*
Jabez Hyde, jr. *Susquehanna Co.*
*Uriah Spencer, *Tioga County.*
James Merril, George Kremer, — *Union County.*
Alexander M'Calmont, *Venango.*
Archibald S. Tanner, *Warren Co.*
Joseph Lawrence, Joseph Ritner, Alexander Reed, Thomas H. Baird, Thomas M'Giffin, — *Washington County.*
John Young, James Clarke, Andrew Boggs, — *Westmoreland County.*
*Charles A. Barnitz, *William Diven, *Philip Smyser, *John Gardner, — *York County.*

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NAYS.

*James Buchanan, *George B. Porter, *Jacob Peelor, — *Lancaster County.*

NAYS.

*Hugh M'Cullough, *Robert W. Houston, *M. R. Buttz. — *Lancaster County.*

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* Those gentlemen whose names are marked with an asterisk, voted against the first, second, third, fourth and fifth resolutions: all the others voted in the affirmative on these five as well as the sixth.

REPORT

AND

CORRESPONDENCE

OF

The Commissioners

FOR

PROMOTING THE INTERNAL IMPROVEMENT OF THE STATE.

HARRISBURG:

Printed by J. S. Wiestling.

1825.

REPORT

OF THE

Canal Commissioners.

Report of the Commissioners for promoting the internal improvement of the State.

Pursuant to the requisitions of the act, entitled "An act providing for the appointment of a Board of Commissioners, for the purpose of promoting the internal improvement of the State," passed the 27th day of March, 1824, the Canal Commissioners respectfully

REPORT:

THAT in consequence of the anxiety of this board to procure and transmit, along with this communication, a report from the United States board of internal improvement, on the practicability of making a canal through Pennsylvania, from Philadelphia to Pittsburg, and an assurance that they would "make a report in part soon after they assembled at Washington," as well as the time that was required to make draughts and profiles of the summer's work, which is herewith transmitted, have caused an unavoidable delay in making this report.

Although the appointments bear date only four days after the passage of the act constituting the board of canal commissioners, yet from their places of residence being so distant from each other, and from the seat of government, it was not until the sixteenth of April following, that the members assembled in Lebanon, and organized themselves by choosing one of their number president of the board. To fulfil the object of the law under which they were appointed, they were "required to employ an engineer, and such other aid or assistance as they should find necessary." The board thereupon resolved to employ an engineer

of known talents, skill and experience in canaling, if such an one could be found, and submit to him the organization of "such other aid or assistance as he should find necessary," and accordingly they directed their president to make enquiries for such an engineer, and engage his services, and also such other assistance as should be thought necessary, while the members of the board returned to their respective residences, to prepare for spending the summer in executing the trust confided to them.

On the tenth of May the commissioners met in Philadelphia, and the president of the board reported that he had made the most diligent search and anxious enquiry after an engineer who was experienced in constructing canals, and that all his efforts to procure such an one had been unavailing, but that he had engaged a scientific gentleman of that city, to conduct the surveys betwixt the Schuylkill river and the Susquehanna, by the Great Valley of Chester and Lancaster counties, and had also made an agreement with a surveyor to take the levels and run the surveys along that proposed line of canal. The commissioners therefore immediately waited on the engineer, to inform him that they were ready to proceed to the survey, but to their surprise and mortification, learned that he could not then accompany them, as he had other engagements that demanded his attention. Thus the first efforts of the board to procure an engineer proved unavailing, as did all their subsequent enquiries throughout the season. Indeed, men thoroughly acquainted with the science of engineering and the art of canaling, are so scarce in the United States, and the laudable spirit of improvement throughout the Union is so great at present, that gentlemen who have made themselves acquainted with constructing canals are all engaged.

The commissioners have sought for and will employ a capable engineer, as soon as a suitable one can be procured. None but a man of first rate talents, tried integrity and approved experience can be relied on. In the mean time they have employed surveyors, and will continue to employ the best and most capable men that they can procure, to run experimental lines and collect materials, that will enable an engineer, whenever one can be engaged, to perform his duties with a full knowledge of all the facts necessary to correct conclusions. We hope by this method to do as a great sister state has done already, raise up a set of men who will make themselves acquainted with canaling in all its branches, and who will be useful to the commonwealth that has brought them forward.

The board were informed that the general government had expressed a willingness to grant Pennsylvania one or two members of her corps of army engineers, and on the 12th of May they addressed letters to two members of the Pennsylvania delegation in Congress, requesting them to make enquiries of the proper department, to know whether they could get an engineer, and also whether it was the intention of government that any part of the late appropriation made by Congress, for making certain surveys, was intended to be expended in Pennsylvania. To this an

answer was received on the 21st of May, by letter, dated the 13th, wherein the writer says, "I have no doubt we shall be able to obtain an engineer and procure aid in money," and on the next day the president of the board wrote to our members, requesting them to procure and send on as soon as possible, one or two members of the United States corps of engineers.

On the 27th of May, a letter was received from a member of Congress, stating that the Pennsylvania delegation had had several conferences with the Secretary of War, on the subject of our application for assistance, and that the routes west of the Susquehanna were deemed of national importance, and would be surveyed by the United States' corps, but that the routes east of that river not being looked upon as of national concern, could not be surveyed by the government. We should, however, in the survey of those routes, have the assistance of major Long, or some other member of the corps of engineers. By this letter, this board was advised to first examine and survey those routes that were deemed peculiarly state objects, and defer the examination of the western routes until the United States board of internal improvements would be ready to join us and assist in having them completely surveyed.

On the 31st of May, another letter was received from our attentive and indefatigable member at Washington city, dated May 22d, wherein he writes that "the President and Secretary of War, accord entirely in our wishes, in relation to furnishing aid to explore the routes west of the Susquehanna, as soon as the United States engineers can be disposed of for that purpose. If you make application through the Governor, for an engineer, to assist in viewing the eastern routes, the Secretary of War will immediately order one to join you, wherever you may wish." It is scarcely necessary to remark, that this last suggestion was instantly attended to, and a letter addressed to the Governor on the subject. The same person, in a letter of the 26th May, says, "I have no doubt that as soon as the request is made by the Governor, the order will issue to major Long to join you."

On the 2d of June, the board received a letter from another of our representatives in Congress, wherein he says, "it is very much the wish of the Secretary of War to comply with the request of the commissioners, but the severe indisposition of one of the officers of the corps, has obliged the war department to supply the discharge of his duties by major Long, the gentleman otherwise intended to be detailed to have met the board of commissioners at Norristown; but that three members of the corps of engineers will be directed to meet this board at Pittsburg, to explore the western routes."

June 7th, the board received a letter from the Governor, stating that he had written to the President of the United States, for an engineer to assist in the canal surveys.

June 16, a letter was written to Jonathan Knight, Esq. of Washington county, inviting him into the service of the commonwealth, as a topographical engineer, but to which the board

received a reply from Mr. Knight, that he could not assist us, as he was already engaged in the service of the United States board of internal improvements.

On the 29th of June, the board received a letter from the Governor, enclosing the copy of one from the Secretary of War, wherein he writes, that the Pennsylvania delegation in Congress had written to the President of the United States, requesting a survey of the Susquehanna, and also asking that the United States engineers may be allowed to aid the state commissioners in exploring their canal routes. In this letter, aid is promised to the canal routes, but not to the survey of the Susquehanna river. The Secretary also states, that the board of internal improvements had received orders to join this board at Pittsburg. On the same day, we answered the Governor's letter, and also wrote to the board of internal improvements, apprising them of our intention to join them at any time and place they might designate.

On the first of July, the board engaged the services of a second surveyor, and on the sixth of July they made an agreement with a third one, to run some levels near the city of Lancaster, but owing to sickness the latter gentleman was prevented from executing the work he had undertaken. Finding our various efforts to procure the necessary assistance, almost all prove abortive, the board determined to make another trial to the east; and accordingly our president went to Philadelphia, instructed to purchase a spirit level for the state, and if possible get some good surveyor to use it. He procured the instrument, and with it another party was formed, who ran about forty miles of experimental lines or levels, on the north and on the east of Lancaster city. The benefit of having this instrument belonging to the commonwealth, was so apparent throughout the latter part of the season, that the board have engaged four other instruments to be made by the first of April next. When the commonwealth has the proper instruments, young men will be found, who will very soon learn to use them with accuracy and despatch, and in this way, the fruitless efforts to get assistance from abroad, will be superceded by the culture and encouragement of genius at home. It is due to candor to acknowledge, that the over anxiety of the board to economise the funds of the commonwealth, made subject to their draft, and their dependence on foreign aid, was an error. We have found by observation and experience, that purchasing the proper instruments and encouraging active men who have some general acquaintance with science, to use them, is the most effectual method for the state to get a proper corps of civil engineers, and to have the most and best work done in the shortest time and least expense.

During the discouraging disappointments that the board has met with in their efforts to procure such assistance as might fulfil the intentions of the Legislature, and satisfy public expectation, they have received from the officers of the state government every aid within their power. On the 20th July, another letter was received from the Governor, covering a copy of one from him

to the President of the United States, on the subject of the promised assistance of engineers. July 31st, we received a letter from the United States board of internal improvements, acknowledging the receipt of our letter to them, but stating that they could not then name the time or place of meeting.

August 7th, a letter was received from the Secretary of the Commonwealth, covering the copy of one from the Secretary of War, stating that orders had been issued to the board of internal improvements, to join this board at some suitable place, as soon as convenient, to explore the canal routes through this state. On the 16th of August we received another letter from the Secretary of the Commonwealth, enclosing the copy of one from the United States board of internal improvements to the Secretary of War, and from him to the Governor, stating that they intended to join this board at Pittsburg, on or about the 10th of September next. From the tenor of this letter we learned, that the general government had made no provision for surveying our Pennsylvania routes the present season, and that all the assistance we had now to expect, was a reconnoisance of them by the board of internal improvements.

August 20th, the Secretary of the Commonwealth furnished the board with a copy of a letter he had that day written to the Secretary of War, urging him in the most pressing terms to furnish the board of canal commissioners with suitable and efficient assistance to survey the western routes through this state. On the same day, the members of the board divided; one of them remained in Lancaster county, to conduct the surveys at which they had been engaged for some time previous, while the other two members set off from thence to meet the United States engineers at Pittsburg. But on his way thither, the president of the board took a tour through the east and north parts of the state, to procure, if practicable, an additional leveller, to assist in the remaining surveys.

The board flatter themselves, that an enlightened public will see, in the foregoing narrative, a complete apology for their not having an engineer, as directed by law. The utter impossibility of procuring one, has added very much to the labors of the board, by imposing on them many duties which by right belong to an engineer. This, however, has had some beneficial advantages, as it has given the members of the board an experience and a more intimate knowledge of the art of canaling, than they would probably have acquired, while trusting to a third person.

Having shewn the exertions we made to procure an engineer, we have next to give an account of what we did without one. The duties enjoined on us by law, evidently required three separate and distinct processes: First, a reconnoisance, or a ride over the country intended to be examined. By this, the general features of the country, the shape of the hills, and course of the streams are learned; after which some regular plan of operations can be formed as to the general course of the intended canal, and what will be proper to have surveyed, and what is wholly unne-

cessary. Second, running experimental lines, or taking running levels. This is a summary process to obtain the height of dividing ridges, the distances of places, the fall of streams, and where feeders can be carried to certain points, as well as where the canal may be located. Third and last, is the actual location of the canal, which can now be done to the best advantage, having, by the previous process, obtained a full knowledge of all the facts necessary to be known. On the final location of the canal depends the exact estimate of what it will cost. It has been very justly remarked, by a scientific gentleman of much experience in canaling, that "the preliminary investigations should, for ultimate economy, be exceedingly liberal;" and with this view the board have endeavored to have what was done, well executed.

In the survey between the Schuylkill and the Susquehanna, the board acknowledge themselves under great obligations to Samuel Haines, Esq. of Philadelphia, for his kindness in presenting them with a map of Chester county, with part of the counties of Montgomery and Lancaster, containing a draft and profile of an experimental line he had run some months previous, throughout the whole route we were bound to examine between those rivers.

Having organized a surveying company, they commenced operations on the 24th of May, on the bank of the Schuylkill, at the mouth of the East Valley creek or Valley Forge, about 19 miles from Philadelphia, and 56 feet above tide water. From whence they surveyed up that creek to its source, by the White Horse tavern, in Chester county. From thence they continued along the south side of the North Valley hill, near its base, to the East Brandywine creek, a short distance above Downingtown.—Thence, continuing along the same side of the Great Valley, they crossed the West Brandywine by Coatsville, after which they came into a much more hilly and broken country, but continued westward along the valley to Buck run, up which the levels were carried to the mill dam of Thomas Atkins. From Buck run the survey was carried over the ridge that divides the waters of Delaware from those of the Susquehanna. From thence to the "Gap," at Henderson's tavern, in Lancaster county, the ground was very broken. But after much trouble and delay in winding round the ravines made by the head of the Octorara, on the 19th June they reached the Gap, which is a remarkable depression in the hill or mountain that divides the Great Valley of Chester and Lancaster counties from the Pequea valley. Here they found the summit of the ridge to be 587 feet above tide water.

An important question now presented itself to the board:—"How is this Gap hill to be crossed?" To answer this question satisfactorily, levels were carried down each side of it, and a survey was made along it for a few miles westwardly, and during these surveys various and extensive reconnoisances were taken by the commissioners, to ascertain the best route for a canal through Lancaster county. These excursions led to the determination of running an experimental line across the county, to find

the depth of the creeks and the height of the ridges between them, and accordingly a running level was carried from the Gap, across the Pequea creek, over to the west end of the Welsh Mountain, and from thence across Mill creek to New Holland, and along the crown land, between Mill creek and the Big Conestogoe, to near the Blue Ball tavern. Returning to New Holland, the survey was carried from thence northward over the Big Conestogoe and Cocalico creeks, to near New Ephrata. By this line of levels it was discovered that the creeks of Lancaster county, which crossed the desired course of the canal, ran in very deep ravines far below the level of the rich lime-stone country that lies between them. This survey convinced the board that it was utterly impracticable to make a canal on the north-east of Lancaster city, without resorting to the gravel hills and mountainous ridges that skirt round the east, north-east and north of that county, and in which all her fine streams have their sources.

The surveying company returned again to the Gap, and on the 3d of July recommenced a survey from the north end of what has been assumed for a summit level, and continuing at the same level, they surveyed round the heads of Pequea creek, past the Compass tavern, in Chester county, and over to the Welsh Mountain. They then skirted westwardly, along near the base of that mountain, to its western termination by Ellmaker's run; from whence, turning short round to the north side of the mountain, they continued up parallel with Mill creek to its sources, around which they wound their way, and crossing the ridge that divides that creek from the Conestogoe, they continued at the same level betwixt the Welsh Mountain and the latter creek, to a point on the Conestogoe, about one and a half miles east of Churchtown, and thence crossed over the valley to Turkey Hill.

But it would be a tedious, uninteresting and unprofitable task to follow the windings of this company through the broken mountainous ridges that surround Lancaster county. It will be sufficient to say, that from the 3d of July to the 28th of September, they were constantly employed feeling their way over and around the innumerable ravines made by the heads of the Pequea creek, Mill creek, Big Conestogoe, Muddy creek, Cocalico creek, Indian creek, Middle creek, Hammer creek, the Big and the Little Chickesalunga creeks, Conoy creek and the Conewago creek, and that during that time they surveyed about one hundred and fifteen miles, chiefly at the same height, which had been assumed for a summit level at the Gap. This extensive survey was made along side of gravel ridges, and above the general level of the lime-stone land. No projected route of a canal can be better supplied with water, or would retain it better than this route. But the stony, rough and rocky country through which it winds its exceedingly serpentine course, as will be shewn by a draught accompanying this report, and the great length of canal in one county, as well as the numerous aqueducts and embankments that will be required to make it, all combine to insure its rejection. But, although the board cannot recommend this as the proper

route for a canal from the Schuylkill to the Susquehanna, yet the survey will be useful; for, while it must satisfy the public that this route is too circuitous to be adopted, it has shewn satisfactorily where feeders can be obtained for a more direct line of communication, and also where useful lateral canals may be constructed.

While the above surveys were making under the superintendance of one of the commissioners, the other two members of the board continued to reconnoitre the country in all directions where they deemed it possible to carry a canal, and also had several experimental lines run to ascertain the height of crown lands and the depth of streams. They had a running level taken, that commenced where the main line had crossed the South run, a branch of the Pequea creek, near Yoder's saw mill, and thence up that run to the summit of the ridge that divides the waters of the Pequea from those of the West Brandywine. From whence the survey was continued along that ridge, northward to Cambridge. Another running level was carried from the main line of level, a little east of Churchtown, eastward past Morgantown, to the greatest depression in the crown land, between the heads of the Big Conestogoe and those of French creek, near Springfield, in Berks county. These different experimental lines, when compared with the Gap, in Lancaster county, gave the following result:

The height of the Gap above tide water is	587 feet.
The dividing ridge near Springfield is	641
The crown of the hill near Cambridge is	711

Thus it appears that the great difference of elevation of the above passes, will give a decided preference to the Gap for a passage between the Schuylkill and Susquehanna, and in addition to the quantity of lockage that will be avoided, the hill at the Gap is much narrower, and can be cut down or tunnelled to a much lower point below the crown of the hill, than either of the other places. The supply of water at the Gap, for a summit level, will be much more abundant than either at Cambridge or Springfield.

An experimental line was run from Witmer's bridge, over the Big Conestogoe, a little east of Lancaster, up to and round the north-east side of the city to the crown of the hill between the two Conestogoe creeks, and thence northward along the top of the ridge to the summit of the Gravel hill near Litiz, from whence, skirting round the heads of the Little Conestogoe, and thence along the crown land, between Carter's creek and the Big Chickesalunga creek, to a gravel hill north of the road from Litiz to Manheim. Thence down to Manheim, and from Manheim southwardly along the ridge that divides the Little Conestogoe from the Big Chickesalunga, to a few perches south of where the Lancaster and Harrisburg turnpike road crosses this ridge. They afterwards had another experimental line run from Witmer's bridge to the top of the ridge that divides the Big Conestogoe from Mill creek, and along the crown of the ridge from opposite Montgom-

ery's mill to the Philadelphia and Lancaster turnpike road, and eastwardly along that road, across Mill creek, to the summit of the hill that divides that creek from the Pequea. Thence southwardly along the ridge between those creeks, to Lampeter square, where the various experimental lines terminated on the 17th of August. In the surveys between the Schuylkill and Susquehanna, the commissioners used every effort to accomplish them before the time of meeting the United States board of internal improvement at Pittsburg, but were continually retarded by a succession of wet weather, during the months of June, July and August, and had at last to leave them unfinished.

By an arrangement among the members of the board, one of them remained in Lancaster county, along with the surveying party, while the other two set off for the west, and on the ninth of September they met the United States board of internal improvement at Pittsburg. These were general Bernard and colonel Totten, of the army, and John L. Sullivan, Esq. attached to the board as civil engineer, together with three gentlemen in their suite. Here the commissioners learned from the United States engineers, that they were directed by the Secretary of War to co-operate with the Pennsylvania canal commissioners, in taking a reconnoisance of a route for a canal from Pittsburg to Philadelphia, in company with, and under the directions of this board, and that they would be ready to set out on the tour in two or three days.

On the 13th of September, the party started from Pittsburg, and examined the Allegheny river up to the mouth of the Kiskaminitas, and this latter river up to the junction of the Loyalhanna and the Conemaugh. They next examined the Conemaugh river, from its mouth to Johnstown, at the confluence of the Little Conemaugh and Stony creek, noticing particularly the manner in which this last river breaks through the mountains Laurel Hill and Chesnut Ridge. From Johnstown they continued up the Little Conemaugh, to the junction of the south fork of that stream with the mountain branch of the same. Thence up the latter creek to Croil's mill, where they turned off to spend the Sabbath at Ebensburg, in Cambria county.

On Monday, the 20th of September, the party set off from Ebensburg, accompanied by several gentlemen of that country, who officiated as guides, and conducted the engineers to several sources of the Conemaugh, which were fine streams issuing out of the Allegheny mountain. These were guaged, and the company rode over the mountain and guaged the different branches of Blair's creek, and following its course, they came to the Frankstown branch of the Juniata, which they guaged also. From whence they continued down the Juniata river to the Susquehanna, and down the latter to Harrisburg.

From Harrisburg they continued down the left bank of the Susquehanna to Middletown, and from thence examined a route for a canal past the city of Lancaster and the Gap, to the west branch of Brandywine creek, and past Westchester to Philadel-

phia. It is but justice to state, that along the whole line from Pittsburg to Philadelphia, the party were treated with great kindness and hospitality by the enlightened inhabitants.

We forbear to give a detailed account of this reconnoisance, as a report on the subject is expected from the United States engineers, that will no doubt be more satisfactory to the public. Upon the arrival of the party in Lancaster county, that member of our board who had been engaged through the summer east of the Susquehanna, took a short time to visit his family, and one of those who had been at the west, conducted the board of internal improvements to Philadelphia, while the other took charge of the surveying company, and hurried them off to the Allegheny mountain, to make some surveys and examinations, (before the setting in of cold weather,) which the United States engineers deemed essential, previous to their reporting on the practicability of making a canal through Pennsylvania.

The surveying party commenced operations on the 4th of October, at the head of the Frankstown branch of the Juniata, or the junction of the south fork with the Beaver d m branch of that river. From whence they ran an experimental line up the latter stream, and up Blair's creek to the top of the Allegheny mountain, in Bedford county, a few miles south of Blair's Gap. A second party was formed, and directed to survey the streams composing Burgoon's creek, which rises in the Allegheny, north of Blair's Gap. The Allegheny mountain being yet in a state of nature, wild and uncultivated, and covered with immense forests and impenetrable thickets, it became necessary to hire some additional hands to perform the double duty of pilots and axemen to the surveying parties. The summit of the mountain, at the place it was first crossed, was found to be 1677 feet above the head of the Juniata, and the highest springs of water, which are very large and copious on each side of the dividing ridge, are 111 feet on the one side and 192 feet on the other, below the crown of the hill, and are one mile and three-fourths apart.

A survey or line was run down on the west side of the mountain to Lilly's mill, at the head of the mountain branch of the Conemaugh, or the confluence of Bear-rock run, and the Laurel Swamp run, and a bench made at 945 feet above the head of the Juniata. A calculation shewed this to be 1407 perches distant from a corresponding level on the other side of the mountain. But an open cut, carried to 35 feet deep, at each end, would reduce it to rather less than four miles necessary to be tunnelled. The level was continued down the Conemaugh, something more than two miles, to the mouth of Benn's creek, which is 144 feet lower than Lilly's mill, and about six miles from a corresponding level on the east side of the mountain. An experimental line was next carried up Benn's creek to its source, and the mountain was at this place found to be about 1590 feet higher than the head of the Juniata.

After the second company that was formed, had surveyed Sugar run and Old Gap run, two principal branches of Burgoon's

creek, they next carried a survey up the north branch of Blair's Gap run, and over the mountain, by the turnpike, to the Laurel Swamp, and from thence down the Laurel Swamp run to Lilly's mill, giving another complete section of the mountain and the course and fall of several of its streams. They next carried a survey up M'Closkey's run, which is a branch of the Conemaugh, and passing over the mountain to the east side, they ran experimental lines up the west and the south-west branches of Blair's Gap run. The south or main branch and a part of the west branch had been previously surveyed by the first company.

The second surveying company next began on the east side of the mountain, at the same level with Lilly's mill, and ran a horizontal line round the face of the mountain, northward to the Old Gap run, to discover whether the whole or some of the principal branches of Burgoon's creek, could not be used as feeders to a summit level at this height. And after having performed this service, they were paid off and discharged. In the meanwhile, the first company were engaged at a similar work, on the west side from Lilly's mill to the south. In running which line they crossed Limestone run, Benn's creek, Beaver dam run, Trout run, Laurel run, and finally, the south fork of the Conemaugh. And it was found that all of them could be conveyed into a summit level, corresponding with Lilly's mill. They next carried the experimental line down to the junction of the two branches of the Conemaugh, about twelve miles below Lilly's mill, and found that the mountain branch had 384 feet of fall in that distance.

While the foregoing surveys were making, the member of the board who was with the surveying companies, took extensive and numerous excursions over the Allegheny, to become thoroughly acquainted with the mountain and its streams. In several of these reconnoisances he was accompanied by gentlemen of the neighborhood, particularly John Blair, Esq. from whose politeness and attention the board have derived much pleasure and advantage.

In the midst of those busy bustling scenes the two other commissioners arrived, and the board forthwith got instruments made for guaging the different streams that can be conveyed to the assumed summit level. They also hired two additional hands to assist in this business, and beginning at Old Kittanning run, they proceeded to measure every stream on the east side of the mountain, to the south fork of Blair's Gap run; from whence they passed over the mountain and measured all the streams on the west side, from Lilly's mill to the south fork of the Conemaugh. The result of which measurements was an aggregate of upwards of forty cubic feet of water per second, and that at the dryest season of the year, it being near the last of October. They next directed a reservoir to be surveyed at a place remarkably adapted to that purpose, where a broad marshy bottom, at the confluent streams composing the head of the mountain branch of the Little

Conemaugh is succeeded by a narrow pass or approximation of the hills by Lilly's mill.

November had now set in.—The days were short and the weather getting cold on the top of a bleak mountain. The board therefore determined to prove the line of levels taken over the mountains, and cease their operations on the Allegheny for the present season. They accordingly had a line run straight over the line of tunnel, from Lilly's mill to a corresponding level on the east side of the mountain, and were much gratified to find that in a circuit of about twelve miles, in going and returning, the levels closed within one foot and two tenths; but the mountain was 22 feet higher above the line of tunnel than it was where the first survey crossed it.

Having effected as many preliminary surveys about the mountain as the lateness of the season would permit, the board next determined to have an experimental line run down the Juniata and Susquehanna, to Harrisburg, so as to give, with other levels that have been heretofore made, the height of the Allegheny mountain above tide, and the whole quantity of lockage that will be necessary between Philadelphia and Pittsburg. They accordingly directed the surveying company to perform that duty, while the members of the board, together with their draughtsman, proceeded direct to Harrisburg, in order to prepare the summer's work for laying before the Legislature.

It is with great pleasure that the board can bear testimony to the spirited exertions and indefatigable zeal of the party to whom this survey was entrusted, for their endeavours to complete the line of levels before the setting in of the winter; but the weather proved favorable, and they arrived in Harrisburg on the sixth of December, and were shortly afterwards paid off and discharged.

Thus were the surveys closed for the season, having had, since the 24th of May last, about 480 miles of levels taken, the greatest part of which was done with a single company. The closing of the surveys gives us as a result, that from tide to Harrisburg, is a rise of 297 feet.

From Harrisburg to the head of the Juniata is	589
From the head of the Juniata to the tunnel,	945
From tunnel level to the summit of the mountain,	754
Total rise from tide to the summit of the Allegheny,	2,585 feet.

Upon the arrival of the board at the seat of government, they immediately commenced arranging the mass of materials that had accumulated during the summer, which, with making draughts, calculations and corrections, has occupied them ever since, and has been one cause of delaying the present report:—But the principal cause of the delay has arisen from an expectation, that before this time they would have been furnished with a report from the United States' board of internal improvements, on the feasability of making a canal through Pennsylvania.

On the 16th of November, we wrote to the United States' engineers, giving them an account of the surveys on the Alleghe-ny mountain; and on the 27th of that month a letter was receiv-ed from general Bernard, of the corps of engineers, stating that they would soon make their report. On the 11th of December another letter was written to them, in which an account was giv-en of the survey of the Juniata, together with other information not before communicated:—To which last we received no an-swer until the 28th of December, when another letter was receiv-ed from general Bernard, stating that they were preparing a gen-eral report on all the canal routes that "they had been ordered to examine during the last summer, and that they hoped to have it ready in the course of January next." Being extremely anx-ious to have the whole proceedings of last summer laid before the Legislature as soon as possible, the board directed their presi-dent to proceed forthwith to Washington city, to see and converse with the United States' engineers, and urge them to give us a separate report on the Pennsylvania route. This duty was per-formed, and they gave him a verbal assurance that they would report to us in a few days; but the reason of their not yet report-ing, must, we presume, be sought in the difficulty of arranging such a great quantity of materials, as their own rides and recon-noisances as well as the operations of several topographical bri-gades under them during the last season, must necessarily have given them. It may not be improper to remark, that during our intercourse with the United States' board of internal improve-ment, we have been met with a frank and friendly disposition on their part, and assurances of there being no insuperable barrier nor any very great difficulty along the whole route from Pitts-burg to Philadelphia.

Since our arrival in Harrisburg, we have also addressed seve-ral letters to sundry gentlemen in different parts of the state for local information; to the most of which we have received prompt and satisfactory answers.

Having given an account of the causes why we could not get an engineer, and a narrative of what we have done without one, we will now give some opinions respecting the practicability of making a canal through our state, and an estimate of its probable cost, trade and profits.

It may be laid down as an incontrovertible position, that a ca-nal can always be made where there is land to make it on and water enough to keep it full; therefore the term *impracticable* can only be understood in a relative sense, either as it regards the means of making the canal, or that the quantity and profits of the trade which will go through it, will not justify the expense of construction.

A canal of 24 feet wide at the bottom, having 40 feet of water line and four feet deep, with locks of 80 feet long by 11 feet wide, will, we think, suit our trade and combine the most advan-tages. Such a canal and locks will readily pass boats carrying from 40 to 50 tons, or what will be a proper draught for two hor-

ses. If, however, one horse boats, carrying 25 tons, be preferred, as will generally be the case, the excess and consequent wastage of water by locks of this size will be but trifling.

That our views may be more distinctly understood, we avow it as our decided opinion that there should be a leading, uninterrupted canal, made and owned by the commonwealth, the whole length of the state, so that a boat loaded at Pittsburg can land her cargo on the wharves of Philadelphia. This canal divides itself naturally into four sections.

Section 1. From Philadelphia to the Susquehanna, a few miles above Harrisburg, to be fixed by the best place of taking the water out of that river, and of crossing it by an aqueduct.

Section 2 From the east bank of the Susquehanna to the upper fork of Frankstown branch of the Juniata, one mile and a half below Hollidaysburg, in Huntingdon county.

Section 3. From the forks of the Juniata over the Allegheny, to the forks of the Little Conemaugh river, in Cambria county.

Section 4. From thence to Pittsburg.

In section 1, from Philadelphia to the Susquehanna, there will have to be one summit level with three tunnels, or two tunnels with two summit levels. The first and principal one of which is at the Gap, 16 miles east of Lancaster city. The crown of the hill is 587 feet above tide, but the board determined to pass it at 519 feet, which will require half a mile of tunnel. This height however was assumed without having had sufficient time to make the necessary surveys. We are not therefore prepared to affirm that it is the best that can be adopted. Nay we are now rather of opinion, that a lower summit will be better.

Into this summit level all the heads of the Pequea creek can be carried by a feeder of twelve miles long, which will also make a valuable lateral canal, leading towards several iron works on the Big Conestogoe, the heads of London run on the west side, and several of the heads of the Octoraro creek, as well as Buck run and the west branch of the Brandywine, on the east side of the Gap hill, can all be conveyed into the summit level. The early part of the season being very wet, and the surveys made there in June, we could not ascertain the quantity of water that those streams yielded in a dry season, but have no hesitation in saying that the united waters of so many creeks must be an ample supply for the summit level of a canal.

If, however, those streams united should prove insufficient to pass the trade, which must necessarily be very great, we have ascertained by actual levelling, that the heads of Mill creek and the main branch of the Big Conestogoe can also be taken in by extending the Pequea canal. This summit level will extend from London run on the west to Buck run on the east, a distance of about 14 miles; or if the west branch of the Brandywine be deemed necessary for a feeder, it will be better to carry the summit level four miles further, to near Coatsville, in Chester county. So much of the summit level as is in Lancaster county, will be easily made, but that part of it which is in the county of

Chester, is rendered difficult by ridges and ravines, and at the hill which divides Buck run from the Octoraro, there will be a short tunnel necessary to pass 67 feet under the crown of the hill. At the east end of the summit level the canal will have to drop down 147 feet by 18 locks, and will cross the West Brandywine by an aqueduct of 70 feet above the water. The site for an aqueduct across this creek is excellent. Thence to the East Brandywine is seven miles, over as good ground as can be desired.

Crossing the East Brandywine is the most formidable difficulty on the route along the great valley, for it is 120 feet below the level of the ridge that divides the waters falling into it from those running to the Schuylkill, and as that ridge has not sufficient water to feed another summit level, there is no alternative but to bring the deep cutting through that ridge and the aqueduct over the East Brandywine to one level, which we have assumed at 88 feet above the creek for the aqueduct, and 32 feet for the deep cutting through a ridge of limestone.

From the West Brandywine level to that assumed for crossing the east branch, there is a fall of 41 feet that will require five locks. After crossing the East Brandywine the ground is excellent for a canal to the deep cutting at the White Horse tavern, which is a distance of seven miles. From the Gap to the Schuylkill the surveys were carried along the north side of the valley, giving to the canal a southern exposure.

The ridge at the White Horse tavern being passed, two lines present themselves, one of which only was surveyed. The one along which the levels were run, is down the East Valley creek to Valley forge, a distance of 10 miles, having 275 feet of fall that will require 34 locks. A good line of canal can be had down this creek, except that in some places it will be difficult to avoid the limestone. The whole distance from the Gap to the Schuylkill at Valley forge, is 38 miles, and the fall is 463 feet, along which there will be required one tunnel, two deep cuttings and three aqueducts.

The other line that we have not had time to survey, would, after leaving the ridge near the White Horse tavern, keep along the south side of the valley and enter the Schuylkill either opposite to Norristown or near the mouth of Gulf creek. From a reconnoisance of the ground we incline to think that this last is the most eligible.

In company with the United States engineers a reconnoisance was taken of a canal route, to which they seemed to give the preference. It mould diverge from the line we have been running, either at Buck run or at one of the branches of the Brandywine, and keeping down the stream, wind round and cross over those creeks and pass near Westchester; crossing in its course Chester creek, Ridley creek, Crum creek, Darby creek and Cobb's creek, to the Schuylkill, or rather over the Schuylkill to the Delaware by the city. The advantages of this line are, that it would be more direct than one the whole length of the great valley. It

would avoid the limestone of the valley, and pass entirely through ground that is good for holding water; it would have a plentiful supply of water from the creeks it crossed; it would save the immense aqueduct over the East Brandywine, and the deep cutting at the White Horse tavern. By going near Westchester and through the county of Delaware, it would accommodate a greater district of country than a canal taken into the Schuylkill near Norristown; it would bring the wheat floated on the canal near to a good market at the Brandywine mills; and lastly, it would keep the commonwealth's canal clear of all collision with or dependence on the Schuylkill navigation company.

The board have had very great difficulty in determining on the best route for a canal through Lancaster county, and it was not until many experimental lines were run, that they came to the conclusion that no better route could be had than one close by Lancaster city. We will not pretend to deny but that our wish to make the state canal touch all our cities, had its due weight in fixing this determination.

From the west end of the summit level at London run, the line will descend along its west side 120 feet by fifteen locks, and cross over the Pequea by an aqueduct below the mouth of Brisban's run, at which level it will continue down the right bank of the creek, and pass over the ridge that divides the Pequea from Mill creek at Lampeter square. From thence the canal should be let down 56 feet by 7 locks, and cross Mill creek by an aqueduct over a mill pond, where the road from Lampeter square to Lancaster crosses it, and thence down the creek to opposite Montgomery's mill, where the ridge that divides Mill creek from the Big Conestogoe will have to be passed.

The quantity of lockage down from this last level, and the height of the aqueduct over the Big Conestogoe (which should cross a little above Humes' factory) will depend upon the method adopted for passing the ridge west of the city, between the Little Conestogoe and the Big Chickesalunga creeks. If a second summit level be adopted to cross that ridge, and a lateral canal be run to Hammer creek (which will be useful as leading to valuable iron works) to serve as a feeder to this summit level. In that case the aqueduct by Humes' factory may be made at whatever height will combine utility and economy. But if the ridge be passed, as we think it ought to be, by a tunnel from Kauffman's run, that falls into the Little Conestogoe to Hershey's run, or to Heestan's run that falls into the Big Chickeys. In that event, the aqueduct over the Big Conestogoe must be made to suit that level. By adopting the latter plan, a second summit level will be avoided and bringing Hammer creek as a feeder, rendered unnecessary, and also about 150 feet of lockage will be saved.

From the west end of this level, continue to lock down as the canal passes up the Susquehanna, and across the two Chickasalunga creeks, Conoy creek, and Conewagoe creek, to a proper level, to cross by an aqueduct over the Swatara, which if not

elevated enough must lock up past Harrisburg, to where it debouches into the Susquehanna.

We would have pronounced this section difficult of execution, owing to the streams throughout the whole route crossing the line of canal, had we not been assured by the United States board of internal improvements, in their letter of the 4th of October last, that "they had found the whole line from Harrisburg to Philadelphia favorable, and perhaps as little expensive per mile, as ever occurs in forming a canal through a country not absolutely a plain."

Section 2. From the east bank of the Susquehanna to Frankstown:—although at the commencement of making the canals, we think it will be imprudent to undertake such an expensive work as an aqueduct over the Susquehanna, yet that it will have to be done eventually, we have no doubt. In selecting a suitable place to cross the river, it will be proper to keep the ultimate erection of an aqueduct in view. But there is another interest which should be attended to, in selecting the site for an aqueduct, which is a canal from the Susquehanna to the Potomac, by the Conedogwinnet and Conococheague creeks. Such a canal is so necessary, to the rich counties of Cumberland and Franklin, as well as to divert the trade of the upper Potomac country, to our metropolis, and also to bind our whole commonwealth together, by the ties of mutual interest, that we think it ought to be considered a state object, if not of primary, at least of secondary moment. We would not have adverted to this, at this time, but that we think a single acqueduct over the Susquehanna, may be made to answer both the Potomac canal and the one by the Juniata. Having selected a proper site for a future aqueduct, embracing the above views, a few piers can be erected that for the present will answer to support a towing rope or chain, and hereafter will form part of the aqueduct; after which, by removing the rocks below, or by a small dam in the river, a passage can be made to let the canal boats float over the river, which may be done in perfect safety by using splash boards to the boats, or by a safety ark.

The Susquehanna passed, no other difficulty of much moment presents itself along the whole line of the Juniata. Along this route the scenery is sublime, towering mountains, covered with broken fragments of rock, are profusely scattered on each side of the river, but the stream has worn a channel down to the very base of these huge masses of stone and earth, and there winds its way as gently as if it glided through a rich champaign country. These rude mountain chains which to the early settler of the western wilderness, presented so many formidable ramparts, that had to be scaled at infinite labor, by his pack horses, have to the eye of an engineer, intent only upon leading the richly ladened boat, really no existence. True, they rise in terrible array around him, but he fears them not, he heeds them not, except with the view of supplying himself with materials to build locks, dams and aqueducts, or to load his boat by robbing them of the rich mineral treasures with which they abound. The Juniata is in

some two or three places, confined by the mountain, so as to require in such parts a slack water navigation, which will be easily done, as the bottom of this river throughout, as well as the Susquehanna, is paved with solid rock.

From the Frankstown fork of the Juniata, to the Paxton creek below Harrisburg, by the sinuosities of the rivers is 142 miles. But we conceive that a canal would be much shorter, by avoiding many of the bends in the river. The fall that must be overcome by locks in that distance, is 589 feet. After viewing the Juniata, one of the United States engineers in a letter, says, "I have never seen a stream so capable of improvement as this." On the north side of the river, along which the canal will have to be carried, the tributary streams are small, and will require but few aqueducts.

Section 3. From the upper forks of the Juniata, to the forks of the Little Lonemaugh, is a distance of 27 miles. In this short distance, however, the only mountain between Philadelphia and Pittsburg presents itself. An observation of the celebrated Mr. Fulton, was, "that where the heads of several large streams are found near to each other, there is uniformly a depression in the mountain that divides them." This is evidently the case between the heads of the Juniata and Conemaugh, and between the Potomac and the Youghiogeny. The general range of the Alleghenies, have been usually estimated at 3,000 feet above tide, while at these passes the actual levelling shews them to have but about 2,500 feet of an elevation. The lowest place between the Savage river, a branch of the Potomac, and Deep creek, that runs into the Youghiogeny, is said to be 2,486 feet, while the summit of the mountain betwixt Benn's creek, a branch of the Conemaugh, and Bob's creek, that runs into the Juniata, is by our measurement 2,476 feet above tide. That part of the mountain immediately over the line assumed for a tunnel, has an elevation of 2,585.

The difference in the height of the mountain at the two passes, is very little, but there is one striking dissimilarity which gives a decided preference to the route through Pennsylvania, which is the vast amount of lockage which may be saved by a tunnel between the Juniata and Conemaugh. The Deep creek pass, it is understood, will require a tunnel of from one and a half to two miles long, and yet very little lockage will be saved by it, the mountain in that place being so broad and flat on the top, that it has a descent of less than two hundred feet in 16 miles, west of the apex, while on the west side, on our route, the descent from the top of the mountain is 898 feet in about 5 miles. A tunnel of four miles long will pass 754 feet below the crown of the hill, or 1831 feet above tide.

The project of tunneling some three or four miles through a mountain is, to the uninformed, a fertile source of amusement, from which they can extract the value of their taxes in good humoured laughter, and to the envious, and secret or avowed enemy of public improvement, it cannot fail to be a subject of malignant

and bitter sarcasm. Even good men, who love to see the improvement of their country, have been startled at the idea of burrowing in the ground for a few miles, to let large boats pass through the bowels of the Allegheny. To such it will be a consolation to know, that tunnels are now become and becoming very 'common.' An engineer of the first standing in this country, has said, "that tunnels are now so common, that the necessity of them is no greater obstacle than the increase of expense." And the United States engineers, in a letter to this board, of the 4th of October last, say, that "the art of canaling and perforating mountains with tunnels, being in modern times in European states, a practice of too frequent occurrence to be deemed an obstacle, where the object of the work warrants the expense."

A tunnel is a passage like a large well, dug horizontally through a hill or mountain, where there is not water enough to lock over it, or where the lockage over would be too expensive. They are protected by arches, unless where the solidity of the rock above renders arching unnecessary. Although they are more expensive and tedious in the execution, than any other works in canaling, yet they are less liable to decay or injury, having no perishable materials; neither summer nor winter, cold nor heat affects them. Thirty-five feet of deep digging is estimated equal to the cost of tunneling. If, therefore, 35 feet of deep cutting, into the top of a hill, be equivalent to an open cut at the ends of a tunnel, the double of the difference in height between 35 feet and the depth of the tunnel below the crown of the hill, will be the quantity of lockage saved, and forms a fair off-set against the expense of the tunnel.

Doctor Aiken, in speaking of canals in England says, "instead of cutting them through level tracts, so as to make a wider ditch, its canals are carried over mountainous districts, where the sole method of avoiding the difficulties of steep ascent and descent has been to bore through the very heart of the hills, and navigate for miles within the very bowels of the earth. At the beginning of the last century, it was thought a most arduous task to make a *high road* practicable for carriages, over the hills and moors which separate Yorkshire from Lancashire, and now they are pierced through by *three navigable canals*."

The following list will exhibit a part of what has been done in the way of tunneling in France and England.

	AGGREGATE. Miles, Per.
The Oxford canal has two tunnels, one of 1188 yards,	216
The Ellesmere canal has two tunnels of 487 and 775 yards,	229½
The Leeds and Liverpool canal has two tunnels, one of which is 1530 yards,	278
The Grand Union canal has two tunnels, 1166 and 1524 yards,	1 169

	AGGREGATE. Miles.	Per.
The Chesterfield canal has two tunnels, one of which is 2850 yards,	1	198
The Crumford canal has one tunnel of 2966 yards, and several smaller,	1	219
The Old Birmingham canal has two tunnels, one of a mile and a quarter, the other 1000 yards,	1	262
The Liecestershire and Northampton canal has four tunnels, of 286, 880, 990 and 1056 yards,	1	264
The Edgebarton canal has four tunnels, 110, 400, 500 and 2700 yards,	2	34½
The Worcester and Birmingham canal, of 29 miles in length, has five tunnels, one of 2700 yards long, 18 feet high, and 18½ feet wide; and four others of 110, 120, 400 and 500 yards long,	2	56½
The Hereford and Gloucester canal of 35½ miles, has three tunnels of 440, 1320 and 2192 yards,	2	78½
The canal between the Thames and Medway has the largest tunnel in the world. It is two miles and a quarter long, 24 feet wide on the water line, 24½ feet high to the apex of the arch, and the tunnel holds 7 feet deep of water,	2	80
The Thames and Severn canal has one tunnel of 4300 yards,	2	142
The Leominster canal has two tunnels of 1250 and 3850 yards,	2	287
The Trent and Mersey canal has a tunnel 2880, yards in length, and in some parts cut out of the *solid rock*. This canal is 93 miles long and has four other tunnels of 131, 350, 572 and 1241 yards,	2	300
The Grand Junction canal has two tunnels of 3045 and 3080 yards,	3	153½
The Marthertedville canal has a tunnel about *three and a half miles long under a mountain*,	3	160
The Huddersfield canal of only 19½ miles long, with a lockage of 770 feet has a tunnel of 3 miles and 1540 yards, *through a rocky mountain*,	3	280
The Dudly and Owen canal has three tunnels of 623, 2986 and 3776 yards, *upwards of* 4 *miles*,	4	52
The canal of Picardy has two tunnels, one of 1191 yards and the other of *three miles* and 1026 yds.	4	83
Twenty canals have above *forty-seven miles of tunnel*,	47	22½

On our own side of the Atlantic, and within a few miles of our own borders, the making of a tunnel *three miles* in length, has been contracted for. It is on a canal to unite Lake Erie and Ontario, on the Canada side of Niagara river, passing the high-

lands of which Queenstown Heights is a part; a great portion of which is expected to be solid rock, and the tunnel to be of large dimensions.

In running the experimental line to the south of Lilly's mill, at the assumed height for a tunnel, the survey passed along the face of two coal banks, some miles apart, and indications of coal were seen at two other places on the same level; strong indications of coal were likewise discovered on the east side of the mountain, a few feet below the level of the tunnel line. These as well as all the lines we have run, and the observations we could make, convinces us that all the strata in the Allegheny mountain are in horizontal layers, and are composed of clay, loom, sand and gravel, intermixed with small stones and beds of bituminous stone coal, with ledges of thin flag stone, which last are the only strata we discovered in the mountain that could with propriety be denominated *rocks*. Indeed solid rock in large masses, no where makes its appearance on the surface of the ground, nor in the deep ravines that are worn out of the sides of the mountain.

By giving a small curve to the line of tunnel, it may be brought so near to the course of some of the branches of Bear-rock-run, that from the deep ravines of those streams, shafts can be sunk or drifts carried down to it for a great part of the distance, and thus at every opening that is made, miners can be set to work each way. Whenever the Legislature shall think proper to begin a tunnel, it may be carried on expeditiously by setting three setts of hands to work at each end, and six sets of hands at every shaft or drift, so as relieve each other day and night, summer and winter. We have a well founded expectation, from the appearance of the mountain strata, that no great difficulty need be apprehended; but at any rate, nothing more difficult than solid rock can occur, and should that be the case in any part of the work, it will save arching. The flag stone that appears will be admirably adapted for arching the tunnel, where arching is necessary. By laying down wooden railways for trucks, with cast metal wheels to run upon, one horse can haul four or five tons at a load out at the ends of the tunnel, and can even from the centre of the tunnel, make five trips in a day.

Pennsylvania has exceeded the world in building bridges, and it would be counting too much on her suppinenss, to suppose she would forego the trade of an empire, rather than undertake a tunnel that cannot cost above half a million of dollars. But the tunnel, as well as eight or ten hundred feet of lockage, may be dispensed with until the remainder of the great canal is accomplished, during which time the trade will be interrupted by a portage of ten or twelve miles only. A turnpike crosses the mountain about two miles north of the proposed line of tunnel, but a turnpike or even rail road, can be taken over near the line of canal, as the streams on the east of the mountain commence their course at an angle of about five degrees, while those on the west

side begin to descend at only three degrees from a horizontal line.

From the forks of the Juniata to the forks of Blair's creek, the rise is 579 feet in 9½ miles; in this distance there is no difficulty whatever, except the quantity of lockage. From thence to the east end of the tunnel is one mile and a quarter, and has a rise of 366 feet. This last is up a deep, narrow ravine. Thence through the tunnel to Lilly's mill, is 1407 perches, of which 127 perches will be an open cut. Thence to the forks of the Little Conemaugh the fall is 384 feet in a distance of 12 miles, presenting no difficulty worth mentioning, except the quantity of lockage. This section of the canal will have 1,329 feet of lockage and four miles of tunnel, if the level that has been assumed should be adopted.

We have reason to believe that water enough can be brought to a higher summit level and shorter tunnel. Probably the tunnel might be reduced to 2½ or 3 miles, but the expense of the additional lockage would more than counterbalance any saving in the cost of tunnelling. If the expense alone is to govern the selection of the place for the tunnel, it is demonstrable that a lower level than the one we have assumed, even as low as the mouth of Benn's creek, which is six miles from a corresponding level on the east side of the mountain, but would be reduced to 5½ miles by an open cut at each end; even this level would be a gain, as for an additional $ 180,000 laid out in tunnelling another mile and a half, there would be 288 feet of lockage saved. We do not recommend this length of tunnel, we only mention it to show that a shorter one than four miles would be impolitic. The expense is not the only governing principle. The repairs of locks and the pay of lock-keepers, the delay of trade and supply of water, are all to be considered, and all bespeak as long a tunnel as can well be executed.

To the above observations we may add an extract of a letter to one of the commissioners, from John L. Sullivan, Esq. an engineer of pre-eminent acquirements and acknowledged talents, now a member of the United States board of internal improvement, wherein he says, "I am pleased you have found coal in the mountain, as, if accessible by the eastern part of the navigation, it may help materially to defray the expense of the excavation of a tunnel. I recollect, in passing a tunnel in England, to have seen others branching off to coal mines. Indeed, the existence of a body of coal in the hill, is a good reason for fixing the tunnel at as low a level as practicable, so as to embrace all the coal above the line, and avoid the leakage that might occur in the openings made at a lower one."

In September the United States engineers guaged several of the mountain streams, which they no doubt will mention in their report; but as they did not measure all that can be taken into the summit, nor was it at the driest season of the year, we think the measurement which we made on the last of October, when the wa-

ters were unusually low, is more to be relied on. It is as follows:

		Cubic feet.
Old Kittanning run gave per minute,		57
Old Gap run,	do.	60
Sugar run,	do.	75
North branch of Blair's run,	do.	45½
West branch of the same,	do.	36
South branch of the same,	do.	88
		361½

Dropping the odd foot and a half per minute, the whole of the streams we have measured will stand thus:

Six streams on the east side of the mountain, (as above) give per second in cubic feet,			6
And on the west side of the mountain—			
Bear-rock run gave per	second,	1½	
Laurel Swamp branch,	do.	2	
Benn's creek,	do.	3	
Beaver-dam run,	do.	¾	
Trout run,	do.	1¾	
Laurel run,	do.	1	
South fork of Conemaugh,	do.	24	34
Total number of cubic feet per second,			40

The three northern or first named streams on the east side of the mountain, are scarcely worth going for, but all the other streams can be very easily conveyed to the summit level.

The above quantity can be depended upon, for there are other streams on the west of Lilly's mill that were not guaged, which would make good any leakage in the feeders. We have then the following results:

	Cubic feet.
Per second,	40
minute,	2,400
hour,	144,000
day,	3,456,000

At the dry season of the year, those streams yielded nearly three and a half millions of cubic feet daily. This quantity of water will fill 490 locks of 80 feet long, 11 feet wide, and 8 feet lift every day, or a lock full every three minutes. It will fill a lock at each end of the summit every six minutes, and will pass 327 boats daily. Again, supposing the boats to carry 25 tons each, which is but half of what they might get through the locks with, it would give the incredible quantity of 8,175 tons every 24 hours. But again, if but half of these boats carry a load the whole length of the canal from Pittsburg to Philadelphia, paying a toll of $8 per ton, and the other half return empty, they would in 245 days, that the canal may be navigated, pay the enormous sum of

$8,011,500 annually. The above views are beyond the utmost limits that credulity itself can prescribe to our future trade, and consequently the water at command is more than can ever be needed for the summit level of a common canal. But allow the three northern streams forming Burgoon's creek not to be brought, which would diminish the quantity three cubic feet per second, and admit the other streams to waste as much in collecting them; nay, if instead of six cubic feet, we allow for a deficiency in the feeders equal to ten cubic feet per second, still there is more than sufficient to pass 6000 tons over the summit daily, or pass a trade that on the whole canal would pay a toll equal to six millions of dollars annually. The above calculations are founded upon the lowest stage of water, whereas in the early part of the season, when the trade will be most lively, the water will also be so very abundant, that but a small portion of that at command dare be introduced into the canal.

Least, however, the foregoing views should still be objected to, we will give another so much less flattering, that we think the most fastidious will not have room left to cavil. This whole section is 27 miles, from which deduct the four miles of tunnel, in which there can be nothing lost, either by evaporation or soakage, leaving 23 miles of canal exposed to those wastages. The evaporation and soakage of the feeders, as run on the ground, is equal to 14 miles of canal. The average wastage of six canals in England and New York, gives 1.12 cubic feet per second per mile. Therefore the feeders will waste 15.68 feet per second, leaving of the 40 cubic feet of running water, only 24.32 cubic feet per second, that can be realized in the summit level. A lock of 80 feet long, 11 feet wide and 6 feet lift, holds 5280 cubic feet of water, to which add one-fifth for leakage at the gates, it gives 6,336 cubic feet as necessary for a lock full. Having laid down these premises, we will suppose a trade that would require the passage of 100 boats a day over the summit, which would be 25,000 tons. This will require 150 lock fulls. If the boats passed alternately, in regular succession, 100 lock fulls would answer; but if they all went one course it would require 200 lock fulls:—therefore the medium is taken as a fair estimate, 24.32 cubic feet per second is 2,101,248 in twenty-four hours. But 150 lock fulls is 950,400 cubic feet, therefore 2,101,248 less 950,400, leaves 1,150,848 cubic feet of water undisposed of This much will supply the soakage and evaporation of 12 miles of canal.

The wastage of the canal is thus provided for, 6 miles each way from the ends of the tunnel; but 6 miles from the east end will sink the canal about 800 feet, and carry it one mile below Blair's tavern, at which place, or probably two miles above it, Burgoon's creek may be brought into the line. This creek is an excellent stream, near the mouth, and would have to be lifted but a short distance up it to meet the line of canal. There is too, a small mill stream that falls into Blair's creek, near his mills, which, with the accession of numerous springs, will all supply soakage and

evaporation. Two miles further down, the whole of the south fork of the Juniata may be connected with the line. From the junction of Burgoon's creek the locks may be 7 feet lift, and after the south fork is introduced, they may be the full lift of 8 feet.

From the west end of the tunnel, the six miles of canal that is provided with wastage water will descend about 200 feet, previously to the termination of which it will receive the Munster branch, and many, very many, small streams. A few miles lower down it may be met by the south fork, which receives large accessions of water below where it is taken out as a feeder to the summit. All this proves to a mathematical certainty, that there can be no want of running water, independent of reservoirs. But it may be asked, what becomes of the soakage? Will it not find its way into the beds of the streams below? And can it not be taken into the next succeeding level of the canal? Most certainly it can, and the idea of providing for the wastage of the canal, on that account, beyond a mile from each end of the tunnel, is wholly unnecessary. If the first locks be 7 feet lift, the surplus water would supply the canal for 5 miles from each end of the summit level;—if of 8 feet lift, $4\frac{1}{4}$ miles each way, and still pass 100 boats a day over the summit; from which there can be no doubt but the wastage of the canal, combined with fresh supplies from the springs, will supply the soakage. But to render "surety doubly sure," we surveyed in a reservoir to be formed by an embankment above Lilly's mill, where the hills approach very nigh to each other, but above which the bottom land spreads out so wide that a dam of 50 feet high will cover 120 acres of land. Such an embankment can be very readily made at this narrow pass by the dirt from the west end of the tunnel; and such a pond will hold about 70,000,000 of cubic feet of water; equal to a daily supply of 573,770 cubic feet, or 81 lock fulls throughout the months of August, September, October and November. This great reservoir, which will embrace the confluent waters of Bear-rock run, and the Laurel Swamp run, and must receive the drainage of about 15,000 acres, can readily be filled by the melting snows of winter, the overflowing of the mountain streams of spring, and the copious rains of summer.

We have been a little more minute and particular in describing this part of the line, than may perhaps seem necessary;—because, on the feasibility of passing the Allegheny with a canal depends, in some measure, the encouragement to execute the whole line, or to commence any part of it. We think, however, that the inconveniency of a transhipment and a few miles of portage, for a few years, ought not to prevent Pennsylvania from opening *the best line of connection that exists between the tide-water and the Ohio river.*

Section 4. Although western Pennsylvania is in general hilly and uneven, yet along the bed of the rivers, from the forks of the Little Conemaugh to Pittsburg, it is a gradual inclined plane, slightly concave, giving to it a fall that is continually diminishing from the mountain downwards. In the description of this we

cannot be particular, as it was not surveyed;—our judgment being formed by a reconnoisance on horseback. The summit level we have assumed is 1,831 feet, from which there is 384 feet of fall to the forks of the Little Conemaugh; and the Ohio, at low water at Pittsburg, is said to be 756 feet higher than tide. This will give 691 feet of lockage to this section of the canal.

From the forks of the Conemaugh, down to the junction of Stoney creek, at Johnstown, a distance of 10 miles, the stream is in some places rough and precipitous:—Here it spreads into a broad shallow river, which may in some measure be considered characteristic of western streams, owing to the total absence of rocky shores to confine their waters. Below Johnstown, about two miles, or immediately after the concentrated drainage of a valley 42 miles long, from Berlin, in Somerset county, to Munster, in Cambria county, and 19 miles wide, has united, the river passes through the Laurel Hill, which, though denominated a *hill*, is a very rugged, high, broad and long mountain; yet, through the base of this mountain the river glides with such a gentle current as to appear almost like a stagnant pool. The Laurel Hill presents some rocky bluffs, which project near to the water; but there are always bottom lands on the opposite side of the river sufficient for a canal. Some 12 or 14 miles by water, below this, the river encounters the Chesnut Ridge, which is the most westerly mountain in the great Appalachian chain. Here are some falls, or rather rapids, in the river.

From the Chesnut ridge to Pittsburg, the rivers Big Conemaugh, Kiskiminitas and Allegheny, wind their ways between towering hills of great height, and rich, very rich, alluvial bottoms. Those bottoms, and the first slope of the clay hills present as fine a prospect for carrying along a canal as need be desired. But the canal must be carried high above the beds of the streams, as they are subject to great floods. The Conemaugh, at Blairsville, has been known to rise 13 feet; the Kiskiminitas, opposite Bogg's and Royer's salt works, 18 feet; and the Allegheny, at Freeport, 21 feet perpendicular. The Allegheny, below Freeport, the Kiskiminitas, at the salt works, and the Conemaugh, at one or two places, are confined by the hills, which may in part occasion their great rise at those places. At some such places it may perhaps be eligible to make a slack water navigation. But we conceive that there is no place along the whole section that will not admit of a canal being carried along side of the river, at a moderate expense.

Following the general course of these rivers, the length of the

Little Conemaugh is about	10 miles.
Big Conemaugh,	48
Kiskiminitas,	25
Allegheny,	30
Being the whole length of section 4,	113 miles.

It is worthy of remark, that these rivers, as well as the Juniata and Susquehanna, generally present the best site for a canal along their north sides, thus giving to the whole Pennsylvania line of canal, from Pittsburg to Philadelphia, a sunny or southern exposure, while the grand canal of New York had to be carried along the north side of hills from Albany to Erie. This will give us a great advantage over them, at the setting in or breaking of the frosts of winter.

To those who are acquainted with the immense and incalculable benefit of canals to a country, it will appear like a work of super-erogation to say a word about their uses. Indeed, to attempt formally to prove their utility is like holding a candle to the sun:—But, as many of our citizens have not had an opportunity of becoming acquainted with either canals or the effects they produce, we hope to be indulged in adverting to some of the more immediate consequences that will result to the public by constructing such a great artery of trade to the commonwealth.

A canal is a great labor saving machine, that subdues *time* and *space*. The contemplated canal will bring the farmer of western Pennsylvania, for all general purposes, as near to Philadelphia as if he had to haul his produce there only 60 miles on a turnpike, or 40 miles by a common road. But the benefits will be felt by almost all the interests of society, and it is demonstrable that every part of the state will reap an advantage from its construction.

The Allegheny mountain, as well as Cambria county, near the line of the proposed canal, is covered with an immense quantity of the most valuable timber, that is not only absolutely useless to the owner, but the impenetrable and interminable forests of huge trees, is, to the first settler, who wishes to cultivate the soil, a positive nuisance. This land, which can now be bought at from fifty cents to two dollars an acre, would by a canal, experience a benefit similar to what the Middlesex canal produced. "In the state of New Hampshire, through which the Merrimack flows, timber is now worth from 1 to 3 dollars per ton, standing; before the canal was made it was worth nothing; so that in the article of timber alone, that state is supposed to have been benefitted to the amount of at least 5,000,000 of dollars. The woodland there has risen in price, since the opening of the canal, from 2 dollars to 6, 8 and 10 dollars per acre."

The wood lands and coal lands along the whole route will be affected by the ease and cheapness of transporting these heavy articles to a market. But the sale of timber and coal by the present owners is the least part of the benefit that will accrue to our citizens. In three years the Union canal will be made to the Susquehanna. In a few years the state canal may be finished throughout, and it will not be many years until a canal is carried from the Susquehanna to the Potomac. By these several lines of communication the inhabitants of the rich counties of Franklin, Cumberland, Dauphin, Lebanon, Berks, Montgomery, Lancaster, Chester, Delaware and Philadelphia, can be supplied with fuel,

fencing and building timber from the mountains, thereby enabling their inhabitants to clear more of their farms, and sustain a much more dense population.

Western Pennsylvania will recive a benefit from the canal similar to that which has been experienced by the western part of New York state from the opening of theirs. A gentleman of [O]ntario county, writes that "land experienced a rise equal to an [a]verage of $5 an acre, in one year; produce doubled in price, and cash is given for every thing that we have for sale." The reason of this is obvious, we have but to look at the difference between hauling on our best turnpikes, and transportation on a canal, to comprehend the operation; the teams engaged transporting merchandise from Philadelphia to Pittsburg, have in them from 5 to 6 horses, and each wagon carries from 42 to 50 hundred weight. Allow a six horse team to haul 50 hundred, it will require ten such teams to haul 25 tons; but 25 tons are taken in a boat on a canal, as fast as the wagons can perform their trip. Here then we have 10 men, 10 wagons and 60 horses, on an excellent turnpike road, over the mountains, doing the same work that can be done by one man, one boy, one horse and one boat on a canal.

In outfit—		
50 horses,	at $80 each, will cost	$4,800 00
60 setts of harness,	at 30,	1,800 00
10 wagons,	at 140,	1,400 00
		$8,000 00
Annual interest on the outfit,		480 00
	PER CONTRA.	
1 horse, at $80,		80 00
1 sett of harness,		30 00
1 boat,		150 00
		$260 00
Annual interest on the outfit,		15 60
But again in daily expenses:		
60 horses,	at 75 cents each, including feed,	45 00
10 wagons,	at 50,	5 00
10 men,	at 1 dollar,	10 00
		$60 00
	PER CONTRA.	
1 man,	at $1 00,	1 00
1 boy,	at 75,	75
1 boat,	at 50,	50
1 horse,	at 75,	75
		$3 00

To transport 25 tons by wagons, it will require an outfit of $8,000, and a daily expense of $60; while by a boat, the outfit will be but $260, and the daily expense but $3. A single year's interest on the outfit of the wagons, would nearly fit out two boats with their horses and harness.

The difference in wear and tear is as striking as that of outfit or daily expense, against the wagons, and in favor of the boats.

The toll of 25 tons in a boat would be for 100 miles,	$25 00
The toll of 60 horses, hauling wagons, 100 miles,	48 00

Thus the difference in the expense of transportation is very great, whether we take the toll paid, the daily pay, or the cost of outfit, and the wear and tear of wagons and harness.

These views must convince all, that a canal will take the wagoning off our turnpikes; but if it does, the country will be great gainers by the advanced prices they will get at the canal market. The wagoners must change their occupations, and the horses be put to farm work. A few innkeepers may suffer a partial loss, but it will be very partial if they keep good taverns, for the facilities given to commerce by the canal, will increase intercourse prodigiously. And the same effect will be produced here that has been produced in England. The commerce on a canal never fails to increase the light travelling of horses and carriages over parallel turnpike roads. Take away the heavy loaded wagons, with narrow wheels, which now cut up the turnpikes and keep them rough, and it will soon become smooth and pleasant to travel upon, will be easily kept in repair, and if ever the holders of stock in our mountain turnpikes get any interest on the immense amount of monies they have expended in making such noble roads, it will be after the heavily loaded narrow wheeled wagons are taken off them.

If at 380 miles from Philadelphia, 250 barrels of flour be put on a boat and sent to that port, it will require 30½ days to make the trip, at 25 miles a day; but allow 31 days, and the tolls at one cent a ton per mile, which is about the common toll for agricultural productions, or $3 80 a ton for the whole distance; it will stand thus:

31 days of a man, a boy, a horse and a boat, at $3, is	$93 00
25 tons, at $3 80 for tolls,	95 00
Expense of transporting 250 barrels of flour,	$188 00

Which is a fraction over 75 cents a barrel. But this is calculating on the boat carrying no more load back than will pay her toll. If she had a full back load, she could carry flour that distance for 50 cents a barrel. Hauling flour from Lancaster along the turnpike to Philadelphia, now costs 75 cents a barrel. But even now, when agricultural embarrassments are severely felt, good land will bring from 50 to 100 dollars an acre in that county. How much then will the counties west of the mountains be benefitted, when the farmer can get for his flour as much at Pitts-

burg, or any where along the canal, as can now be afforded at Lancaster?

While the above considerations address themselves to the interests of the west, there are other views that appeal as powerfully to the people of the east. Does the eastern farmer fear a rivalry by letting those of the west have free access to Philadelphia? Is he afraid that by so doing, his market will be injured? If so, his forebodings will never be realised. If Philadelphia only bought as much as she needed for her own consumption, then his fears would be well founded; for by letting in too much produce, the market is glutted, and the prices experience a reduction. But she is a shipping port, and sends to sea the products of the country, and consequently her merchants will give as much as the prices of the article abroad will justify. Will it make one cent a barrel difference to a farmer east of the Susquehanna, whether the western farmer sends his flour by a flat bottomed boat to New Orleans, or by a canal boat to Philadelphia to be shipped off? It cannot. The products of the country must be exported from some sea-port, and it surely cannot injure any person in the east of our state, to have Philadelphia do a vast deal more business, and New York, Baltimore and New Orleans, proportionably less. But without this great opening to the valley of the Ohio and the lakes, Philadelphia cannot bear up under the want of the facilities of water carriage, enjoyed by her rival cities. She must and will become a great manufacturing inland town, but without commerce and without good markets. Give Philadelphia but this canal, and in spite of the efforts of her enterprising neighbors, she will become the metropolis of the Union. To the people of the adjacent counties we would say, "is not her prosperity your prosperity? Are not your interests identified? If she sinks, will not you suffer?" And to a Philadelphian we would say, "you inhabit a lovely city, with unbounded riches, having a capital in real and personal estate, estimated worth $151,121,497.—Can you consent to jeopardise this by supineness?—Can you suffer local views or little projects to divert you from securing the trade of a populous empire, that is rising as by magic, in the great basin of the Mississippi? You surely will not."

Manufacturers as well as farmers are benefitted by canals. The spinner of cotton at Flat Rock, and the worker of marble and soapstone in Montgomery, or slate in York, will exchange their commodities for the iron of Huntingdon, the timber of Cambria, and the salt of Westmoreland. The excavation of the canal alongside of rivers, will afford many good sites for water works. The western people can appreciate the value of a river mill in the fall of the year; and the rude materials, such as ore, limestone, and coal for furnaces, and pig metal for forges, can, by means of the canal, be carried great distances to meet each other.

The projected canal will be of incalculable value to the iron and salt region of Pennsylvania. The Juniata iron-works are well known to make bar-iron as good, if not superior, to any in the

world. They now realise $85 a ton at the works, and send to Pittsburg about 3,000 tons a year, at a cost from 16 to $20 a ton. They there sell it for from $100 to $110. On a canal they could take it for less than $3 a ton. The difference would operate as a bounty. By a canal they would enter into competition with foreign iron in Philadelphia, if not drive the foreign out of the market. The superior quality of the castings made near the Laurel Hill would experience the same advantage. But it is the thriving and rapidly increasing salt-works along this line, that should put to rest all questions about the most eligible route of a canal. The works of the Conemaugh and Kiskiminatas, will in a few years be worth a canal themselves. There are now about twenty salt manufactories along the Kiskiminatas, that manufacture and send to Pittsburg, annually, about 20,000 barrels of salt, and double as many salt-works are preparing. They may be increased to an indefinite extent, as along the whole river salt can be had by boring down about 300 or 350 feet, and there is an inexhaustible supply of stone coal in the hills above the works. Along the Conemaugh too, the salt and coal is obtained in like manner. If the New York canal has enabled them to send their salt to Hartford, in Connecticut, why can not our salt manufacturers send their salt to the counties east of the Susquehanna?

The benefits that will be derived from opening a grand Pennsylvania canal are incalculable. If, in the city of New York, 3,000 new houses have been built, 600 new commercial firms have been formed, and $210,000 of duties have been paid into the state treasury, by auctioneers, during the last year; if their canals, before they are finished, have given them this year, tolls to the amount of $310,000, and have enabled them to distribute so much of their salt as to realise $100,000, from the tax on it of 12½ cents a bushel; if she calculates confidently on realising six or seven hundred thousand dollars of tolls, annually, in a year or two hence—what may we not expect, both of immediate advantage to our citizens, of commercial prosperity to our metropolis, and of revenue to the state, by accomplishing this great work. The aggregate advantages puts calculation at defiance. If, however, there is any thing that will place the benefits of the New York canals beyond all doubt, it is by drawing a comparison between the exports of Philadelphia and New York, before and since their canals have been extensively occupied.

The exports of	1821.	1824.
New York,	$6,980,750	$12,474,653
Philadelphia,	3,797,115	3,800,000

Having given a narrative of the means we used to get an engineer, and of what we have done without one; of the perfect practicability of making a canal, and of some of the fruits which may be expected from it when made, it may be expected that we should go into an estimate of what such a canal as we contemplate may probably cost, and how much money shall be wanted from the trea-

sury to make it. For we take it for granted, that this great work is to be a commonwealth's concern, and will not be left to the stock-jobbing cupidity of private speculators.

It will be recollected, that what we have been engaged in during the last season, was properly the first and second process of the necessary canal examinations. That is, the country was reconnoitered, and more than 480 miles of experimental lines and levels were taken, by which the practicability of making a canal is as fully ascertained as it can be by any process. But on the actual location of the canal must depend the exact calculation of the expense of construction. The draught that will accompany this, will shew some of the ground we have examined, and exhibit the plan of passing the principal barriers between the east and the west. Much has yet to be done, before nice, critical and accurate estimates can be made, but a strictly accurate and exact computation of the cost is not indispensably necessary to justify the commencement of the work. It is sufficient to know that such a work is imperiously called for; that a good route, nay, an excellent route for a canal has been discovered; that that route is an uncommonly direct one, and embraces the most of the great interests of the state; that more water has been found along the route, especially at the great summit level, than can ever be used; that no work of uncommon difficulty or serious magnitude presents itself; that the trade on the canal, and the profits arising from it when finished, must be immense. We say that when all these are considered, a critical calculation of the cost of it is not absolutely necessary. Suppose in the following estimate we should err half a million, will that sum, or rather the fear of an additional sum like that, damp the spirit of enterprise, and keep back the great and glorious work until every big stone or little brook that may be in the way has been solemnly examined, measured and decided upon. True it is, that all these things have to be done, and will be done, before any canal is made, but all are by no means necessary to be done previous to measures being taken to make the canal.

The European plan of building locks of cut stone, and counter arches of brick turned in the bottom, are very expensive and may be justified with them, where timber is scarce and labor is cheap. On this plan locks are the most expensive thing about a canal; but as we are very differently situated, we should have an American system of engineering. On the New York canals and on the Union canal of Pennsylvania, they have used wooden foundations which are not expected to decay, being constanly under water. On these they have built the sides of their locks, faced with cut stone and hydraulic cement. Such mason work on the Union canal, costs $6 a perch, and her whole locks cost about 650 to 700 dollars a foot rise, while those on the New York canals were estimated at $1000 a foot lift. Locks the size we have proposed, can be built for $800 a foot. To obviate this great expense it has been proposed to make wooden locks. The timber is plenty and they could be builded for two years interest on the

cost of a lock of hewn stone. To all these plans there are objections; to the former, on account of the expense, and to the want of durability in the latter.

The Schuylkill navigation company have adopted a plan and built some locks upon it, that promises very fair to suit our country, as being cheap, strong, water-tight, durable and easily repaired. The walls of these locks are built of plain substantial common mason work, that can be done for $1 50 a perch, or much less where the stone is convenient. The bottom and sides are lined with plank, which costs but little, and as little to renew it when decayed. But the renewal will not require to be done oftner than every ten, twelve or fifteen years. Such a lock of 8 feet lift, can be built for $2000, equal to $250 a foot rise, and the plank can be renewed for six months interest on the sum that a lock of the first order will cost. Every person knows what an immense difference there is between expending as much money on any object as can well be devised; and making it strong, plain and substantial, equally good but not equally magnificent, at a much less expense. To illustrate this position, we will instance the national road; a large portion of that magnificent work through the western country, cost on an average upwards of $17,000 a mile. But turnpike roads have been made through the same country, for less than $3000 a mile, that answered the purpose of transporting goods as well as this splendid national highway. If the United States were making a canal, they would never think of any locks but those of the highest finish and most durable materials, and all their other works must be executed in the same stile of workmanship. Estimates made by their engineers must of course be made accordingly. It is perhaps necessary that it should be so. Our national pride is gratified by such noble works. But being only a member of the union, and not having the finances of the nation at command, while we wish our improvements to be good and substantial, it is also our duty to study economy. We can expend 1000 or 1200 dollars a a foot on a lock, but a lock of equal utility can be built for $250 a foot, and kept in repair for 12 or 15 dollars a year; need we ask which should be preferred?

The above remarks will apply to aqueducts. Those of stone are expensive, because all the arches must be turned with hewn stone, but wooden ones will last many years. Wooden aqueducts on the Middlesex canal, near Boston, lasted from 16 to 20 years. A judicious engineer will, however, always adapt the work to the situation, keeping in view both economy and durability.

A permanent aqueduct over the Susquehanna, has been computed to cost about $475,000, and a four mile tunnel through the Allegheny mountain to require $480,000. The Schuylkill navigation company has had a short tunnel executed 17 feet wide and 11 feet high above water, through solid rock, at 40 dollars a yard, running measure. At this rate a four mile tunnel, even if it were all rock, and it can be nothing worse, will cost but

$281,000. The only additional expense that a long tunnel can be over a short one, is the interest on the first money expended, which is unproductive capital until the whole is completed, and the hauling out of the dirt. But on level railways one horse can haul 5 tons at a load. Suppose the dirt or stone to be twice the weight of water, and that the horses shall walk 20 miles in a day, 4 horses will haul out all the dirt from a four mile tunnel in less than four years.

The making of the tunnel may be deferred until the residue of the canal is nearly or altogether completed, but as it is a work that can progress but slowly, and will require but little expense to support as many hands as can well be employed at it, it would be better that as soon as the Legislature shall have decided on beginning the canal, they should authorise the tunnel to be commenced. The making of the aqueduct over the Susquehanna may be postponed for the present, as by erecting a few piers to sustain a tow rope, the canal boats can be floated over the river. We will therefore not include that expense in our estimate.

The expense of a canal from Philadelphia to Harrisburg, cannot be estimated, because a great part of the ground on which we think the canal should be taken, has not been surveyed, and the many streams and dividing ridges that will have to be crossed, between those points requiring tunnels, deep cuttings and aqueducts, each of which must have a separate calculation, would make any estimate of ours at present vague and unsatisfactory.

We may, however, remark, that by adopting the summit level we have assumed, there will be 741 feet of lockage in the distance of about 125 miles, but if the canal is carried into the Schuylkill at the Valley forge, it will reduce the distance perhaps 20 or 25 miles, and take 56 feet from the lockage.

In constructing the canal, we think it ought to be commenced at or near Middletown, and from thence carried westward, past Harrisburg, up to the Frankstown branch of the Juniata. By so doing, whatever is finished will immediately become useful, because as soon as the Union canal is finished, a boat loaded at Philadelphia can pass through the Schuylkill and the Union canal, and reach the farthest western point to which the state canal is completed. From Pittsburg the canal should next be extended up the rivers, to the upper forks of the Conemaugh. The reason why we recommend this plan of operations is, that the lockage being so much less towards the mouths of the rivers than it is near their sources, a much greater quantity of canal can be finished for a given sum of money, and consequently much greater profits will be recived on the sums expended. And as the lockage increases towards the mountain, and the expense increases likewise, the means of meeting that additional expense will be provided by the tolls received on so much of the canal as shall be finished.

Our plan of operations is, to do section No. 2, first; section No. 4, second; and section No. 3, or the mountain section, third; af

ter which section No. 1, must be done; because when the whole commerce of the west is poured through this channel, and at the Susquehanna meets the produce of that noble river, it will be impossible for the Union canal to pass such an immense trade.

From Middletown to Frankstown will be about 145 miles, or 255,200 yards. A canal calculated to hold 4 feet of water, and having the tow path elevated two feet above it, will be 6 feet deep. But this six feet is obtained on sidling ground by digging 3 feet, for the clay that is removed will form three feet of an embankment. Therefore, in es imating the digging, we count on but one yard in depth. The canal is 40 feet water line, and 24 feet in the bottom, making an average breadth of 32 feet; but say 11 yards. This section of the canal will then require 1 yard deep, 11 yards wide and 255,200 yards long, or 2,807,200 cubic yards of earth to be removed. But in many places there will be more than a yard deep of earth to remove, independent of deep cuttings and embankments, which will be estimated separately; we may therefore reckon on an average depth of 4 feet, which will add 935,733 cubic yards, making the total quantity to be removed 3,742,933 cubic yards. This, at 10 cents the cubic yard for removing, will cost 374,293 dollars.

The canal will be carried level from the place of crossing the Susquehanna, above Harrisburg, to the Swatara; therefore there will be no lockage on this part of it. From Harrisburg to Frankstown is a rise of 589 feet, but the Susquehanna will be crossed at least 14 feet higher than Harrisburg, leaving 575 feet of lockage on this section, which, at $250 a foot, will cost $68,750.

The piers to sustain a tow-rope and other works at the Susquehanna, including guard locks, will cost $40,000. There are on this section ten creeks and many small runs that will be crossed near their mouths. The greater number of these may be taken into the canal by dams, over which it will cross on the surface of the pond; but over some of them aqueducts will be required:—$30,000 will be sufficiant for these dams and aqueducts, if constructed of good timber. The Juniata may require three dams, at a cost of 6, 8 and 10 thousand dollars each, or $24,000 in all. Six hundred culverts will probably be required, which, at $60 each, is $36,000; and 200 farm bridges, at $200 each, is $40,000; to which may be added $10,000 for road bridges, and as much for waste wiers. Deep cuttings and high embankments along this line will be very few. The whole extra work required for these, may, we think, be done for $50,000. The guard-locks at the different places of letting down into and leaving the Juniata will cost perhaps $25,000. *Grubbing:*—A great part of the way, the canal will run along river bottoms that are long since cleared, and will not require much grubbing; but allow $500 a mile for the whole, or $1,000 a mile for half the distance, it will require $72,500 for this item. Fencing:—The whole distance on both sides will require $53,592. The damages need not be counted very high, as the owners of land will generally be gain-

ers by the canal, and the people along near the route almost universally evince a patriotic wish for the success of the project. Happily this whole section will interfere with very few water works, and therefore that item of expense will be saved.

We think that $ 40,000 will cover all the damages that can accrue.

RECAPITULATION.

Excavation,	$ 374,293
Lockage,	68,750
Crossing the Susquehanna,	40,000
Dams and aqueducts over creeks,	30,000
Dams on the Juniata,	24,000
Culverts,	36,000
Bridges,	50,000
Waste wiers,	10,000
Embankments and deep cuttings,	50,000
Guard locks on the Juniata,	25,000
Grubbing,	72,500
Fencing,	53,592
Damages,	40,000
	$ 874,135
Add 10 per cent. for contingencies and superintendance,	87,413
Making the total cost of the Juniata section,	$ 961,548

Complete stone aqueducts over the Susquehanna, and over the creeks that must be crossed, and locks of the most expensive kind, would probably add as much more to the expense, and make the whole cost of this section near two millions of dollars.

The mountain section is 27 miles long, but the tunnel (that may be made for $281,600, but which we place at 480,000) will take off 4 miles. The deep cuttings, and ponds or basins for the reception of boats, at each end of the tunnel, will reduce it another half mile. There will be 166 locks required, each one occupying 5 perches, or 830 perches in all; making rather more than 2½ miles to be deducted:—all these added together is 7 miles, and will leave but 20 miles for common excavation. Twenty miles are 35,200 yards, which multiplied by 11, the number of square yards in a cross section of the canal, gives us 387,200 cubic yards. But as there is much side cutting necessary, on a part of this section, we will add 50 per cent. to that quantity, which will give in all 580,800 cubic yards, of earth to be removed. And, as this will in some places be a little more difficult than common digging, we will allow 12½ cents a cubic yard, which will make the excavation on this section cost $72,600. There will be 1329 feet of lockage, which at $250 a foot, will cost $332,250. The deep cutting at the end of the tunnel will cost $25,845. Nothing need be counted for making basins for the re-

ception of boats, nor for a reservoir, as the dirt from the tunnel will do both purposes. Nor need any thing be added for dams, aqueducts or guard locks, as no stream of much size will have to be crossed. Very little will be required for bridges, wast wiers, embankments or extra deep cuttings; say $10,000 for the whole; and as little will be required for damages, for a small portion only of the distance is cultivated, and but few mills that will be injured—perhaps not one. There are but 5 grist mills, 8 saw mills and 1 fulling mill on the main lines, and one grist mill and 1 saw mill on a stream that may possibly, but not probably, have to be resorted to for a feeder. Five thousand five hundred and twenty dollars may be counted for culverts. We count for grubbing, which will be very heavy, 23 miles, at $1,280 a mile, $29,440. Fencing 23 miles on both sides will cost $7,286, and the feeders may cost $15,000. But it is by no means probable that a long feeder will be wanted, and if not, this item is set down at $12,000 too much. Along this section the best of timber can be obtained for all purposes, at the most reduced prices.

RECAPITULATION.

Tunnel of 4 miles, at $120,000 per miles,	$480,000
Excavation,	72,600
Lockage,	332,850
Deep cutting,	25,345
Bridges, &c.	10,000
Culverts,	5,520
Grubbing,	29,440
Fencing,	7,286
Feeders,	15,000
Damages,	10,000
	$987,941
Add 10 per cent. for contingencies and superintendance,	98,794
Total cost of the mountain section,	$1,086,735

Locks made of cut or hewn stone, and laid in hydraulick cement, would add $730,940 to the expense, making the whole cost of this section of the canal also near two millions of dollars.

We annex the following table, giving a comparative view of tunnelling through or locking up to different heights. By taking a high level, a little would be saved in the expense, if we reckon the locks to cost $ 250 a foot: but there is a prodigious quantity of lockage added, with its perpetual inconveniences. If however, the locks were to be built of hewn stone, and counted at $800 a foot, the longest tunnel named would be much the cheapest, and when done must be incomparably the best.

A TABLE shewing the length of tunnel, quantity of lockage, and cost of both in a relative view of six different levels.

NOTE.—By carrying the tunnel on a level with the mouths of any of the runs mentioned below, it will shorten it, but will add 70 feet to the lockage in addition to what is stated in the table.

	Height above tide.....	Height above Pittsburg....	Depth of the tunnel below the top of the mountain...	Quantity of lockage.....	Length of tunnel.....	Cost of lockage.....	Cost of tunnelling.....	Total expenses of lockage and tunnelling.....
	FEET.	FEET.	FEET.	FEET.	PERCHES.	DOLLARS.	DOLLARS	DOLLARS.
Thirty-five feet below the level of the mouth of Benn's creek,	1652	896	933	971	1960	242,750	735,000	977,750
35 feet below the mouth of Limestone run,	1754	998	831	1175	1656	293,750	621,000	814,750
35 feet below the mouth of Bear-rock run,	1796	1040	789	1259	1407	314,750	527,625	842,375
The level of the tunnel that has been assumed,	1831	1075	754	1329	1280	332,250	480,000	812,250
35 feet below the mouth of M'Closky's run,	1871	1115	714	1409	1164	352,250	411,500	763,750
The head spring of Blair's Gap run,	2371	1615	214	2409	480	602,250	180,000	782,250

RECAPITULATION.

	Saving in Expense. DOLLARS.	*Loss in Lockage.* FEET.
From Benn's creek to Limestone run level,	163,000	- 204
From Benn's creek to Bear-rock run level,	135,375	- 288
From Benn's creek to the present assumed level,	165,500	- 358
From Benn's creek to M'Closky's run level,	214,000	- 438
From Benn's creek to the head spring of Blair's Gap run,	195,500	- 1438

The western section, or section No. 4. not having been surveyed, we cannot speak of it with much certainty. From the reconnoisance of the route, we think it is not worse but rather better than the Juniata section. The height of the Ohio at low water, at Pittsburg, is said to be 756 feet above tide, and the west end of the mountain section is 1,447 feet above tide; therefore there must be 691 feet of lockage in this section, and the distance by the course of the rivers is about 113 miles. If it be not more difficult than the middle section, in proportion to the distance, it will cost $749,344. Locks, built of hewn stone, would add $380,050 more to the expense.

RECAPITULATION.

The Middle Section,	No. 2,	$ 961,548
The Mountain Section,	3,	1,086,735
The Western Section,	4,	749,344
		$2,797,623

Many people, no doubt, who have been accustomed to copy after the Europeans, both in their manner of doing such works and in their estimates, will be ready to reject the above calculation as too low. But let it be considered that this canal is one in which lockage is the predominant feature:—that there is 2,595 feet of lockage in about 270 miles; that we have recommended what we think may be denominated an American lock, as we have no doubt but its cheapness will ultimately recommend it to general use in our hilly and well timbered country; that this lock will not cost more than one-third or one-fourth as much as locks built after the European fashion; that we have purposely omitted an aqueduct over the Susquehanna; and counted upon having wooden ones over small streams, where they are necessay. That is, we have studied to do the great work with as little money as possible:—but we believe that on this plan the calculations are ample. If an error is committed, we wish to err on that side that will not mislead the public, and will therefore add to our estimate, $202,377; making the whole amount required, the round sum of *three millions* of dollars. A canal, executed in the expensive stile we have been speaking of, would, we believe, cost bout five or perhaps five and a half millions of dollars. There can be no necessity for incurring so much expense at first; but if, in ten, twelve or fifteen years, when the wooden aqueducts and the inside of the locks begin to decay, it is thought expedient to replace them with permanent stone ones, by that time the trade and tolls of the canal will justify the expense.

If our neighbors of New York have had some advantage over us in lockage, we have an advantage over them in the convenience of materials along our whole route ;—in the low interest of money at present ;—in the low wages of labor ; in the cheapness of provisions ;—in the opportunity of getting experienced workmen ;—in avoiding the errors she has committed ;—and last,

but not least, in climate. This last will give an immense advantage over that state, in forwarding goods and receiving the returns of agricultural products in the spring. If we open this canal, we secure the trade of the west as an inheritance, of which we cannot be divested. If we also extend a canal from the mouth of the Kiskiminitas to Erie, we can take the cream off the lake trade, before the icy fetters of winter are loosened from the New York canal. In proof of this, they took only $4,313 19 of toll in April last, but in May they took $54,103 26. We would anticipate them on the lake, by carrying their May trade to Philadelphia in April.

If we stand on our summit level and look westward, we see our canal extending the influence of its left arm to the rocky mountains, while with its right hand, it is gathering the furs round the Lake of the Woods. If we look from this elevation to the east, we behold the countless thousands of the sons of industry hesitating, when they have reached the Susquehanna, whether they will turn to the right and send their produce to Baltimore, or to the left, and (by the aid of a canal across New Jersey) take their choice of the markets of Philadelphia or New York.

Having already extended this report far beyond the limits we intended, we will only state a few facts, and add some remarks respecting the probable trade and profits likely to be realized by this great canal.

In the spring of 1824, there went through the canal, near the mouth of the Susquehanna, to Port Deposit, to be shipped for Baltimore, 338 arks and 509 rafts, exclusive of a great number that passed down the river. The Pennsylvania canal would have carried almost all this to Philadelphia.

Last spring, 100,000 bushels of wheat went in two months to Baltimore, out of the Tioga river alone, and that *before the navigation of the New York canals had commenced!* Our canal would have intercepted this trade above the Conewago falls, and carried it to Philadelphia.

There is annually about 250,000 bushels of wheat, or flour equal to that amount, carried from Lewistown, on the Juniata, which goes chiefly to Baltimore, at a freight of one dollar per barrel for flour, or $1 37½ if sent to Philadelphia. A canal would secure Philadelphia all this, and the farmers who ship their produce from any part of the Juniata will be great gainers, as from Lewistown flour can be taken to Philadelphia on a canal, for 37½ cents per barrel, and the return loading, such as dry goods, groceries, fish and plaister of Paris, that now costs 15 dollars a ton from Philadelphia to Columbia, and thence to Lewistown 5 dollars a ton, will be carried the whole distance for less than 6 dollars a ton.

A single house in the city of Philadelphia, last year loaded upwards of 200 wagons for Pittsburg. A canal would have got the carrying of this loading and the returns.

The merchants of Pittsburg, in 1815, paid for wagoning in July, $103,000; in August, $112,000; and in September, $83,000.

In three years, it has been stated, the transportation of merchandise to Pittsburg amounted to nearly $5,000,000. But after the late war the transportation to the west was unusually great; not perhaps forming a correct criterion on which to found a just calculation. However. as late as the winter of 1822–23, Mr. Stevenson, a gentleman who resides in Pittsburg, made a report to the House of Representatives, in which he estimates the wagonage to that place, from over the mountains, at $600,000 annually. This much would to a certainty be realized for tolls, or saved in transportation to the people by a canal.

The following comparative view is given of the hauling along one of the turnpike roads leading to Pittsburg, at two different periods. That in 1818 is from Henry Montgomery, who was the keeper of a gate in the Chesnut ridge, and that in 1824 is by Thomas M'Guire, now the keeper of a gate at Laughlintown. The two gates are eight miles apart.

	1818.		1824.	
	Teams.	Horses.	Teams.	Horses.
Six horse teams,	2698	16188	899	5394
Five do. do.	2412	12060	1930	9650
Four do. do.	281	1124	2106	8424
Total,	5391	29372	4935	23468

The average of the above years will give 26,420 horses, that have passed along that road in a year, hauling loads over the mountains. These horses haul about nine hundred weight each, which gives 11,889 tons transported over that *one* road alone. But this is only *one* out of *four* parallel turnpike roads, including the national road. It will not be assuming too much, to allow one and a half times as much hauling to be done on the other three roads. Thus the total hauling over the mountains, is about 30,000 tons annually. So much, at $8 a ton for toll, will give $240,000 a year, even if no other trade was attracted by the canal. But there must be an immense deal more carried on it, as two or three other facts will establish.

In 1820, the freight of flour from the falls of Ohio to New Orleans was $1 25 per barrel. In 1819, it was calculated that between 40,000 and 50,000 tons of produce passed the falls for New Orleans. Pittsburg receives groceries by the steam boats from New Orleans, at a freight of one dollar per hundred.

It is asserted, that from the falls to Pittsburg, goods can be carried for 25 cents a hundred, but allow 37½ cents, or 75 cents a barrel for flour. Flour can be carried on the canal, from Pittsburg to Philadelphia, for 75 cents a barrel, without a back load, and for 50 cents a barrel by the aid of return loading. It then appears that flour can be conveyed from the falls to Philadelphia, by the aid of steam boats on the Ohio, and a canal through our state, for $1 25 per barrel, the same price that is given to New Orleans; but admit it to be $1 50 a barrel, will not the western people be great gainers by resorting to the Atlantic markets,

at 25 cents of difference, rather than go to New Orleans, under many complicated disadvantages, which are so well known, that it is unnecessary to state them.

It is presumable that all the produce which floats on the river, has to pay as much freight as flour. But if 50,000 tons of produce is annually conveyed to New Orleans, from above the falls of Ohio, it is but fair to assume, that the canal will divert it to Philadelphia That quantity passing over the canal, at only $4 a ton for tolls, will yield another $200,000. It may be objected that the canal would not receive all this trade ; but then it must effectually prevent Pittsburg from resorting to New Orleans for groceries, which will be a compensation for any deficiency in the downward trade.

By delivering goods from the sea-board at Pittsburg, for 50 cents, and carrying produce from thence in return, for 25 cents a hundred, the merchants of that place will not only enter into competition with those of New Orleans, at the mouth of the Ohio, but will foreclose the latter from all participation in the commerce of the Upper Mississippi and Missouri rivers.

At three acres to the head, Pennsylvania is capable of containing 10,000,000 of inhabitants, and if we continue to increase in the ratio we have done since 1790, the present century will not have given place to 1900, until we shall count that many within our bouudaries.

Of this territory, the Susquehanna drains,		13,685,600 acres.
	Ohio drains,	10,598,400
Together,		24,284,000

Or what will sustain more than 8,000,000 of people. All of those on the waters of the Ohio, and the greatest part of those on the waters of the Susquehanna are interested in this great canal. But for those on some of the Susquehanna waters, who may be too remote to receive much immediate benefit from it, there will be more than the deficiency made up by Philadelphia and its dependencies. Many of our children may live to see *eight millions* of Pennsylvanians holding social intercourse on the surface of this canal. We purchase and improve estates for our children, and shall we hesitate to leave them this great inheritance ?

In casting our eyes to the west, we behold the following states and territories, interested in our canal :

	Square Miles.	*Inhabitants in* 1820,
Ohio,	38,260	581,434
Kentucky,	37,680	564,317
Indiana,	34,000	147,178
Illinois,	58,900	55,211
Missouri,	62,870	66 586
Michigan, with N. W. territory,	174,000	10'000
	505,710	1,424.726

At 3 acres to each individual, the above territory is capable of sustaining the incredible number of 86,551,467 souls. But rejecting the above as hypothetical, we will suppose them to be filled with a population only as dense as Massachusetts was in 1820. That state then had 521,725 inhabitants, on a territory of 7,250 square miles. The foregoing states and territories will at the same rate support 29,195,731 souls. This prodigious population will be there, before the end of the present century, unless some national calamity shall retard our increase.

By one branch of our canal, we will divide the lake trade with New York, and we will gain as much from Virginia, Tennessee, the Arkansaw territory, and the uninhabited regions beyond the state of Missouri, as the other moiety of the trade, which that state will take from those countries, we calculate upon as making use of a Pennsylvania canal, to reach the sea-board.

When this canal will have to vend the products and supply the wants of such a rapidly rising and extensive western region ; is it probable, is it possible, that it will not pay the interest of the money expended in making it? So far from such being the result, it is as certain as a mathematical demonstration, that it cannot pass all the trade that will be required betwixt the Atlantic and the great valley of the Mississippi.

The profits of canals in England have been so great as almost to exceed the limits of credibility. The people of that island have within 25 years, expended near $150,000.000 on canals An average made of two lists, one of 12, and the other of 26 canals, give the following results:

	Cost.	*Present Prices.*	*Annual dividends*
Average of 12 canals,	£102 1 8	£507 3 4	£27 5 0
Ditto, 26 do.	107 6 2	540 17 4	25 16 0

Taking an average of the whole, the rise on their stocks has been about *five hundred per cent.* on the money expended.

The following canals, being a part of those lists taken separately yielded—

	Cost.	*Present prices.*	*Annual dividends.*
Oxford,	£100	£730	£32
Erewash,	100	1,000	58
Coventry,	100	1,070	44 3*s.*
Birmingham,	25	580	24
Loughborough,	100	3,500	170

To the above list we will add but one other, which is the Grand Trunk or Trent and Mersey canal. This canal has 642 feet of lockage, in 100 miles, and has 220 acres covered by reservoirs, to feed the summit. Besides which it has *five* tunnels, making together three miles. Notwithstanding the expense of its tunnels, reservoirs, and great quantity of lockage for the length of the canal, yet in May, 1824, the shares which originally cost £100. sold for £2,280 ;—nearly *twenty-three hundred per cent. advance.*

We have computed the cost of a canal from Middletown to Pittsburg, made with *American locks*, at $3,000,000. Money

can now be had, on the credit of the state, for 4½ per cent. The interest on three millions of dollars will be $135,000 a year. This much, however, will not be necessary. By dividing the canal into six year's work, it will need $500,000 to be borrowed and expended each year, which will require for interest—

The first year, only	22,500
Second,	45,000
Third,	67,500
Fourth,	90,000
Fifth,	112,500
Sixth,	135.000
	472,500

After which the tolls will pay the interest and extinguish the principal.

On this view of the subject, it will only require the state to advance $472,500, in six years, to complete the whole canal. But even this much will not be wanting. If, in 1825, the state will borrow and expend $500,000, there will be wanting, in 1826, $22,500, to pay the interest on the loan; and the same sum will be required for interest in 1827. But the canal made in 1825 must produce some toll in 1826, which will be applicable to the interest of 1827. As it is not to be expected that the canal can be finished and brought into use so promptly as to yield the full toll on each expenditure immediately, we will suppose that the profits on each years expenditure will be progressive, as 2 per cent. 4 per cent. and so on to 10 per cent. for we cannot permit ourselves to doubt but that the canal, when completed, will yield a sum much beyond that per centage. On this hypothesis, $500,000 expended in 1825, will give $10,000 of toll in 1826; $20,000 in 1827, and so on increasing $10,000 annually, until it arrives at its maximum profit of $50,000 a year. The expenditure of the next $500,000 in 1826, will also produce $10,000 in 1827, which added to the profits of the first year's expenditure, gives $60,000 of toll for that year. If this view of the subject be correct, all the money that will be required from be state will be—

	Loans.	*Interest.*	*Money required.*
First year,	500,000		
Second,	500,000	22,500	22,500
Third,	500,000	45,000	
Less by tolls,		10,000	
			35,000
Fourth,	500,000	67,500	
Less by tolls,		30,000	
			37,500
Fifth,	500,000	90,000	
Less by tolls,		60,000	
			30,000
Sixth,	500,000	112,500	
Less by tolls,		100,000	
			12,500
Amount borrowed,	$3,000,000		
Sum total required from the treasury in 5 years,			$137,500

If the premises laid down be sound, and we think they are, the state has it in her power to make a canal from the west end of the Union canal to Pittsburg, by plighting her faith and advancing the small sum of $137,500 in 5 years, or $27,500 a year, and in 22 years from the commencement, the canal will discharge the debt, leaving the state in possession of a clear annual revenue of $300,000. In 23 years the canal can pay for making itself, without a cent from the state treasury. All that is in reality wanting, is the credit of the commonwealth. But it is more politic, just and proper, to provide an annual sum, and set it apart as a sinking fund, that shall be sufficient to pay the interest and extinguish the principal, in a reasonable time, and thus leave the tolls to be applied to opening other canals; such as the completion of the eastern end of the state canal from Middletown to Philadelphia, and the western end or branch of it to Lake Erie. Likewise a complete navigation from Philadelphia to the Seneca lake, in New York state, and also one from the Susquehanna to the Potomac, by the Conedogwinnet and Conococheague creeks.

The state should make these great primary canals on her own account, and may accomplish all in 12 or 15 years, leaving to companies and individuals to construct the numerous lateral canals and side cuts, that will necessarily be connected with them. Which done, the tolls will support the government, and educate every child in the commonwealth.

Although the lockage on one part of the route may appear formidable, yet if it be spread over the whole line from Philadelphia to Pittsburg, it will fall short of the lockage on many profitable canals that have been executed. Divide the whole canal into 10 mile sections, and there will be but 81½ feet of lockage to each, or only one lock of 8 feet 2 inches lift to the mile. Shall this deter us? Is the magnitude of the undertaking appalling? Let the whole be divided among the militia of the commonwealth, and it will not be *one perch to each man*. Again, if we divide the whole expense of this magnificent work among the inhabitants of the commonwealth, it will be but four dollars to each. But again, there are 200,000 men in the state, able to follow some productive calling. Divide these into 12 parts, one part or the one-twelfth man, can complete the canal in a year, while the other 11 parts shall have fuller employment, be better paid for their labor, and instead of the commonwealth being impoverished by the exertion, she will be a gainer just by the whole value of the canal. She will be that much richer.

A number of untoward circumstances prevented us from completing more of the surveys pointed out by the law creating this board. But we have a flattering prospect of having a more perfect and efficient organization during the ensuing season. And as we expect that a full examination of the various routes proposed between the west branch of the Susquehanna and the Allegheny river, will be made before the next meeting of the Legislature, it is perhaps unnecessary and may be premature to give any opinion about a route that has not yet been examined,

During the ensuing season we hope to have that examination completed, when the Legislature can have a full knowledge of all the facts before them. But in the mean time preparations can be made for prosecuting the canal vigorously, and a beginning may be made from Middletown to where the water is taken out of the Susquehanna, as that portion of the canal will suit either route.

All of which is respectfully submitted.

JACOB HOLGATE,
JAMES CLARKE.
Pennsylvania Canal Commissioners.

Harrisburg, February 2d, 1825.

Letter from Charles Trcziyulny, Esq. to the Governor.

Harrisburg, 9th February, 1825

SIR,

Two of the commissioners appointed to explore the routes of certain canals, agreeably to the provisions of the act of 27th March, 1824; have, I understand, made their report to your excellency. To this report my signature does not appear—When my colleagues brought it to my room, where I was confined by a severe sprain of the ankle, it was proposed by them to read it in my presence, but being unwilling to sign a paper of so much importance to the interests of the state, unless I had an opportunity of a full and satisfactory examination of its contents, it was carried away by them, without the subscription of my name.

I had at that time, in my possession a map and profile, already executed and finished by me, and signed by all the commissioners, shewing the heights or elevations of the Allegheny mountain, between the east and west end of the tunnel. This map and profile, with other papers, being demanded of me in the name of the board, were accordingly delivered to them.

If my health continues to improve, and time will permit, it is my intention to lay before your Excellency, previous to the adjournment of the Legislature, a condensed statement or report of all proceedings and observations, as far as I was personally engaged, in all the routes.

With great consideration,
I have the honor to be,
Sir, your obedient servant.
CHARLES TRCZIYULNY.

His Excellency J. Andw. Shulze.

Charles Trcziyulny's respects to Governor Shulze, asking the favor of his Excellency to indulge him with an inspection, for a short time, of the map recently exhibited by his colleagues to the House of Representatives, in case the same shall be delivered to your Excellency.

C. Trcziyulny being now engaged in preparing his report, agreeably to his letter of the 8th inst. it may become necessary for him to examine the map, previous to his finishing this document, especially as he understands from report, an alteration appears to have been made on the map after it was taken out of his hands by his colleagues.

The Governor will add to the obligation conferred on C. Trcziyulny, if he will send the map, by some trusty friend, as soon as may be convenient for him to do, after it comes into his Excellency's possession.

Wilson's Hotel,
12th February, 1825.

SIR,

I have received your letter requesting that I may send you the map exhibited by the board of commissioners to the House of Representatives. As the map has been delivered to me, for the express purpose of complying with a resolution of the House of Representatives, requiring that it may be laid before them, I am under the necessity of declining to comply with your request. There is no doubt, that the House, upon proper application, will afford you every facility to make out your report.

Very respectfully, &c. &c.

J. ANDW. SHULZE.
February 16, 1825.

CHARLES TRCZIYULNY, Esq.
One of the board of Commissioners.

REPORT

Of Charles Trcziyulny, Esq. one of the board of commissioners for the purpose of promoting the internal improvement of the state.

HARRISBURG, February 21st, 1825.

SIR,

Agreeably to the purport of a letter, which I had the honor of addressing to you, on the ninth instant, I now proceed to give your Excellency a condensed narrative or report of the levelling and surveys of the routes for certain proposed canals, so far as I was personally engaged during the past summer and autumn, as one of the commissioners, under an act of the Legislature, passed the 27th day of March, 1824, by such topographical observations and remarks as may be deemed pertinent to the subject, or tend to elucidate it.

Upon the completion of various preliminary arrangements, and the failure of the commissioners to employ Mr. Strickland, as en-

gineer, conducted chiefly by my colleagues, we repaired in the month of May to the mouth of Valley Forge creek, in Montgomery county, accompanied with Mr. Siddal, a scientific and experienced surveyor and leveller. Here Mr. Siddal began his operations, and commenced a series of levels to the Gap tavern, for the distance of thirty-five miles or thereabouts, partly on the north side and partly on or near the middle of the Great Valley, in Chester county, and chiefly through a limestone soil, of undulating or rising ground. On reaching the Gap, it was found to be five hundred and eighty-seven feet above tide at Philadelphia. After ascertaining this fact, it was agreed to sink the Gap seventy-two feet and overcome it by a tunnel, instead of cutting down, about half a mile in length being necessary to carry the canal into Lancaster county, as contemplated by the act of Assembly. From the Lancaster side of the Gap, the levelling proceeded towards the city of Lancaster, under the direction of the board, for eight or ten miles of descending land, and principally along the side of the Gap Hill, where we entered a limestone valley of rolling ground, the hills or ridges crossing our course. Judging, from the appearances and indications of the country, that it would require deep cuttings to overcome these heavy sections, the leveller was directed to return to the Gap, and try for a more favorable route in a direction to Lancaster, or as near it as might be practicable. Accordingly, a new series of levels was taken from the Gap, in a direction to New Holland, and with the same intent. The result of this proved more unfavorable than the former experiment. The course of levelling was then changed towards Ephrata, principally following the road, and from thence along the road to New Ephrata, where we stopped on the top of a ridge, and benched on an oak within sight of the latter village. The whole country, from the Gap to the bench, abounds with limestone ridges and hills, is exceedingly fertile, well cultivated and handsomely improved, but presents no encouragement for the location of a canal. The project of a route in this direction was of course abandoned. On suggesting the probability of finding a more promising route along the Welsh Mountain for a continuation of a canal, from the Gap to a point opposite the Juniata, or near it, *above all the worst of the falls*, and to proceed by the way of Harrisburg we returned to the Gap, on the north side of the ridge. To accomplish this object with the most effect, it was my advice to carry the summit level as far as practicable, with a view of obtaining a greater power of water, by intersecting the river as high up as possible and avoiding lockage. To this my colleagues appeared to consent, while Mr. Siddal, the leveller, gave the scheme his entire approbation. He therefore commenced at the Gap again, having already established the bottom of the tunnel line to be five hundred and fifteen feet above tide, the levelling and surveying was conducted on the principle of preserving *this height* round the Welsh Mountain, near the foot of the same, so as to take in all the branches of the Pequea creek, and the creek itself. Pursuing this route for more than twenty miles, a new dispute arose between one of my col-

leagues, Mr. Clarke and Mr. Siddal, when the latter became so much displeased as to retire from his employment; a circumstance which I much regretted. Previous to this occurrence, Mr. John Thom had been engaged in surveying and levelling some streams to their sources:—he was now sent for to occupy the station relinquished by Mr. Siddal. We then proceeded on the principles already stated, sometimes with Thom's instrument, both old and shackling, and sometimes with the new level purchased by the board, and continued the same summit level round the Welsh Mountain, and up the Conestogoe valley, keeping near the mountains and ridges, and taking in all the branches of the Conestogoe creek, (and the creek itself may be taken in,) as also Muddy creek, Cocalico, Indian creek, Middle creek, Furnace creek, Hammer creek, Chickasalungo and Conewago, with their several branches to near James Kelly's tavern, about eighteen miles from Harrisburg, where we benched on an oak, making an entire distance of eighty five miles from the Gap. Pleased with the favorable aspect of the country, it was my determination to extend the summit level farther, not only in this direction, but also from the Gap towards the city, when on a sudden the senior commissioner (Col. Holgate) made his appearance at Kelly's tavern, and ordered the leveller and hands to repair immediately to Harrisburg, and join Mr. Clarke, the other commissioner, while I accompanied him to Elizabethtown. We arrived there the same night, when I was introduced to the gentlemen composing the board of the United States engineers. The following morning we started for Manheim, where the board examined Hammer creek. In the afternoon we proceeded towards Lancaster, through an undulated range of limestone country in a high state of cultivation, some of the ridges of considerable elevation, and limestone rocks running near the surface across our course. At night we reached the city, when Scott's map of Lancaster county was produced, and a conversation took place respecting certain routes, in which our views were stated to the board of engineers, but differing in judgment among ourselves, no opinion was expressed by them, as to the future location of the route most proper to be adobted through Lancaster county. Seeing no prospect of coming to a decision, as to this matter, we separated next morning, Col. Holgate accompanying Gen Bernard and the rest of the board to Philadelphia, while I hastened after the leveller to the Allegheny mountain, by the way of Bellefonte, near which my family resided.

Although thus interrupted in my views of finishing the exploration of the remainder of the route, it may nevertheless be proper for me to state, that during its progress, no obstructions appeared to my mind which may not be surmounted, and that without encountering any serious difficulty, or incurring any expense which the magnitude of the object will not justify, while some of them may be altogether obviated or removed by a *judicious* location.

The preservation of a summit level, for so great a length as eighty-five miles and upwards, with forty-five feet breadth on the surface and thirty feet at the bottom, and with four feet depth of

water, is of itself an important circumstance. But there are other considerations which deserve attention. Among these may be noticed the abundance and certainty of the supply of water, even in the driest season, from so many streams (some of them powerful ones) heading in the mountain and running from its base into the proposed summit level, without the expense of feeders, or artificial reservoirs, the saving of lockage, and the retentive quality of the ground through which it would pass being composed of a gravelly-clay soil. To these may be added, the superiority or preference in point of expense and ease of excavation, possessed by canals constructed along the sides of hills or mountains where the slope is not too steep, over those carried through a flat limestone country. The comparative inconsiderableness of damage to farmers, millers and ironmasters, owning the lands through or near where it may pass, is a consideration not to be overlooked. Feeders and reservoirs are not only expensive in their formation, and repairs but generally tend to destroy the water powers of mills and works below them, while the erection of waste weirs will be an effectual means to prevent an overflow of water from the summit level, and for returning the surplus into its original bed. The appropriation of the surplus power of water, which a canal thus constructed will afford to manufacturing purposes, and for feeding lateral branches to the city of Lancaster, and other places and districts more remote, is a matter of no small consequence, in a state where a laudable spirit of encouraging manufactures and internal improvements begins to manifest itself. Such considerations, if duly appreciated, will, it is apprehended, more than compensate for its circuitous location. But the view now presented is not intended to give this route any preference at present over others, which remain unexplored, as no conclusive opinion can be formed until the other routes by the head waters of the Schuylkill shall be viewed and examined.

It is difficult for me, at present, to accompany this report with an estimate of the probable expense of completing this canal. The whole route has not been yet explored, and of the part surveyed and levelled for exploration, extending about eighty-five miles, no actual location has taken place, nor was it in my power to accomplish the location with a single leveller, during the time I remained in those parts: But was I to hazzard an opinion, I might say the average cost of each mile would not exceed twenty thousand dollars.

After resting with my family for a few days, I proceeded to the Allegheny, and joined my colleague, Mr. Clarke, at Blair's tavern, near the mountain. We measured several branches of the waters of the Juniata, though in an imperfect manner, for the want of a stop watch, pointing out the seconds. Col. Holgate arriving at this time, we started across the Allegheny in search of other streams, and to ascertain how Mr. Thom and the hands were coming on.—We came to Lilly's mill, on the west side of the mountain, near the tunnel line, where Mr. Thom was engaged in protracting the differ-

ent courses and distances from the commencing point, as exhibited on the plan by a red line, (explained by the reference,) over the mountain to Lilly's mill. There I learned of him, that one of the chain carriers, Mr John Gerhart, had been ordered by Mr. Clarke to take the level in his place. After entering on his new employment, he run for a feeder route some miles on the west side of the mountain, as marked in the map. Shortly after this Mr. Thom resumed his station, and finished the feeder route, measuring twenty miles and some perches, under the direction of the board ; a good part of it on steep sideling spurs of the mountain. Mr. Thom, by the direction of the board, now took a series of levels from a point in the feeder route, and run to the mouth of the south branch of the Connemaugh, in order to ascertain the fall from the tunnel, also marked on the plan in red. We then returned to Lilly's mill, where the commissioners were. It was proposed by me that the tunnel line should now be run, to which my colleagues assented.—The clouds indicating a change of weather, we stopped after levelling part of a day, and proceeded to assertain and fix the site for the reservoir, likewise marked in the plan:—The face of it is chiefly a thicket of laurel. As soon as it was finished, we commenced again at the point on the tunnel line where we left off, and continued to run the course and take the levels thereof for drawing the profile. On completing the tunnel line, Mr. Thom's correctness as a leveller appeared evident, from his benching within something more than a foot of his former levellings, and corresponding with a calculation of the heights, of which the reckoning had been kept by me. The tunnel line measures four miles and one hundred and twenty-seven perches, as the plan will shew.

About the middle of November my two colleagues took their departure for Harrisburg, after directing Mr. Thom, and requesting me, to repair to the same place. On our leaving the Allegheny, Mr. Gerhart, one of the chain carriers, was promoted to the station of leveller, and appointed to take the command of the party. The new leveller proceed with the hands, as I understood, to level and direct the survey from the junction of Blair's creek with the Juniata, to Harrisburg.

In taking the levels and surveys from the junction of Blair's creek and the Juniata, by Mr. Thom, under the direction of Mr. Clarke, before my arrival, the points of the tunnel were then established, including the seventy-seven perches, with a fall of one hundred and forty-three feet, from the east end of the tunnel line to the sugar maple bench, as explained by the plan.

On refering to the profile in the plan, the height of the bottom of the tunnel line will be found to be nine hundred and forty-five feet above the mouth of Blair's creek, and the distance about eight miles, requiring one hundred and eighteen locks to overcome this distance; the summit of the mountain seven hundred and fifty-four feet above the proposed tunnel line, varying, however, from seven hundred and fifty-four to eightyfive feet, the lowest indenture in the mountain; the whole averaging about five hundred feet. In short, the whole coun-

try, from the upper forks of the Juniata to the forks of the south branch of the Conemaugh, is mountainous : mo untain rising after mountain, in quick succession. The main one, where the proposed tunnel is to pass, is hemmed in and surrounded by other high mountains with steep slopes, separated from one another by narrow ravines, and presenting no favorable situation for canalling, either by lockage or tunnelling. Here nature has refused to make her usual kind advances to aid the exertions of man; mountains are thrown together, as if to defy human ingenuity and baffle the skill of the engineer.

It would be my wish to conclu le the present narrative, already too far extended by the relation of incidents attending the progress of this exploration, some of them of little interest, without expressing any opinion as to the practicaiblity of the mountain section ; but as I have not united with my colleagues in the report submitted by them to your Excellency, a necessity devolves on me to add a few observations on the tunnel line, the most critical barrier in the proposed route, and the only part levelled and surveyed from point to point.

An eminent writer on canals, says "when it is proposed to form any canal, the choice of a skilful and experienced engineer is an object of primary consideration. Without due attention to this object, many impracticable projects may be adopted, and large sums of money may be expended, without accomplishing any important and useful purpose." The failure of the commissioners to procure an engineer, to assist them in fulfilling the objects of their appointment, was much regretted on the outset. During the progress of the examination, subsequent events have convinced my mind, not only of the utility of such an officer, but of the loss sustained by the commonwealth, and which must always be sustained, from the want of one. Without the aid of a competent and independent engineer, to consult with on the present occasion, it is difficult for me to express my sentiments on this subject, with the same confidence as might be done had I possessed the advantage of his advice. I feel, therefore, the delicacy and responsibility of the situation in which existing circumstances place me. But I feel also the obligation which a sense of duty enjoins upon me to proclaim, in unequivocal terms, the result of my own judgment of the matter, whatever it may be, uninfluenced by any consideration arising from a difference of opinion with others.

Judging with due deliberation, from facts ascertained by levels and surveys, and regarding them as the only safe ground of conclusion, I cannot but consider the proposed project of tunnelling the Allegheny mountain, for four miles and a half, as an experiment full of doubts, difficulties and perplexities, wholly inexpedient to venture on, even if practicable, unless I am greatly mistaken in my apprehension as to the cost of such an undertaking. I do not stop here. In my opinion, the measure is utterly impracticable, considering the physical difficulty of execution, and the magnitude of expense which it will involve. I cannot see how the fall of one hundred and forty-three feet, in the distance of seventy-seven perches, as survey-

ed and levelled, and marked in the plan, can be overcome by lockage when the boat is proposed to be eighty feet long, and eighteen locks of eight feet lift in one straight tier are required. Should a project be resorted to for overcoming this fall, by sinking the tunnel line one hundred and forty-three feet below its present depth, nearly striking the sugar maple on the east, and the ash tree on the west, the necessary consequence will be, an increase of one hundred and forty-three feet to the height of the mountain, above the tunnel line, at different points of elevation, and consequently the same increase, to the depth of the shafts necessary to be sunk, making the depth at the highest part of the mountain, eight hundred and ninety-seven, instead of seven hundred and fifty four feet. It must, likewise, have the effect of adding three miles, or nearly so, to the present length of the tunnel, that is to say, seventy-seven perches on the east, to the sugar maple, and seven hundred and thirty-six perches on the west, to an ash bench marked in the plan. The expedient of extending the tunnel line through the mountain, opposite the east end of the proposed tunnel, or of winding round the faces of mountains, to reach the point at the sugar maple bench, or of pursuing a serpentine course round mountain after mountain, so as to arrive at any given point below the sugar maple, will be attended with much difficulty, greatly increase the distance and expense of lockage, and prove more intricate and still less feasible, than the experiment of sinking the present tunnel line.

To make any estimate, in detail or in gross, of the cost of the proposed tunnel of four and a half miles, through the Allegheny, is far beyond the means of calculation possessed by me at present, unless I should substitute conjecture for fact. The contents of the mountain are unknown, and have remained undisturbed since the creation of the world. Before any calculation can be made, for estimating even the propable expense, an engineer must be furnished with the requisite local information, by sinking experimental shafts. The number and depth of the shafts for raising the stuff, pumping the water, and ventilating the tunnel, should be ascertained, and whether galleries be necessary, and side chambers wanted to save the workmen in time of blasting, without being hoistad to the top, or retreating at the mouth. A knowledge of the soil, mineral substances, and all the variety of rock and matter of which the mountain is composed would be useful; whether there be any subterraneous chasms, springs or cataracts, and the number of headings or saughs, for draining the water, and preventing it from incumbering or drowning the laborers, as also the masonry that may be required, the number, power and expense of steam engines for raising the water, stones, &c. from below. These provisions are all essential preparations before the work of the tunnel can be conducted throughout, either with safety to the workmen, or ensuring the expedition and permanency of the work. General Bernard, of the United States board of engineers for internal improvement, was so convinced of the necessity of this knowledge, that when applied to for an estimate of the propable expense of making this very tunnel, he declin-

ed giving it, and with the characteristic prudence, for which he is distinguished, writes on the 30th of December, 1824, "An estimate of the tunnel across the ridge dividing the Little Conemaugh from the Juniatta, would require more local information than I am possessed of now." It may be observed, that General Bernard was furnished with a copy of the profile, shewing the line of the tunnel, and the elevation of the heights of the mountain above it, and had viewed the ground, in company with two of my colleagues, in Septemper last.

Though I have no sufficient data to found an estimate of the expenses of constructing a tunnel of this description, a reference to a few examples, furnished by General Bernard, of the cost of tunnels in other countries, may be of some service.

"*Tunnels in Europe.*

Canal of Great Junction, tunnel of Blisworth, England.

Length,	2, 980 yards,
Profile of excavation,	31 yards.

This tunnel cost $71 04 the running yard, or $2 29 the cubic yard.

Note.—The arches are built of brick, the top and bottom arches are thirteen inches thick, the lateral ones 17 inches.

Thames and Medway canal connecting Gravesend with Chatham, England.

Tunnel length,	4,030 yards,
Profile of excavation,	109 60 yards.

This tunnel has cost $275 28 the running yard, or $2 51 the cubic yard.

Note.—This tunnel is excavated through compact chalk, nevertheless, it having been found, that in a distance of 1700 yards this bank of chalk was not solid enough to sustain itself without masonry, an arch was thrown over. The bottom of the tunnel is 139 feet on an average below the summit of the mountain it crosses.

Canal of St. Quentin, connecting the Oire and the Somme with the Escaut or Scheld, France.

This canal has two tunnels, that of Riqueval and that of Fronquoi, the first is 6,204 yards long, the second 1,193 yards. The tunnel of Riqueval is the longest now extant in Europe, and is of the following dimensions.

Length,	6,204 yards,
Profile of excavation,	59 78 yards.

This tunnel has cost about $212 the running yard, or about $3 50 the cubic yard.

Note.—This tunnel is excavated through chalk hills of no solidity, which necessitated an arch of 19 inches thicknees, and a walling of the same thickness on the whole length. Besides, at several times during its construction, springs of water overflowed the work. The bottom of the tunnel is on an average 270 feet below the summit of the hill crossed by this tunnel.

RECAPITULATION.

The tunnel of Blisworth, has cost per mile,	$125,030 40
Ditto of Thames and Medway,	484,492 80
Ditto, of Riqueval (canal of St. Quentin, in France)	373,120 00 about,
Mean cost of these three tunnels per mile,	$327, 547 73

In the month of May last, a tunnel was commenced in England, through Harecastle hill, as appears from the following extract.

Staffordshire, Grand Trunk or Trent and Mersey canal.

"The additional tunnel, through Harecastle hill, was commenced last month. It is calculated to occupy the labor of five years, during which several hundred men must be employed. The expense has been estimated at a guinea an inch, (forward,) the distance being about one mile and three quarters, or 2880 yards, which alone will make 103,680 guineas. The total expense has been calculated at a quarter of a million sterling; shafts will be sunk, &c. steam engines erected for raising the earth, &c. at different points of elevation—the tunnel averaging about seventy yards in depth, from the surface of the hill. The Grand Trunk canal was begun in 1767, and finished in 1777."—*London New Monthly Magazine, for June* 1824.

It appears from the above extract, that the excavation alone of one mile and three quarters, is estimated to cost $484,185 60, that is $ 4 67 an inch, (forward,) exclusive of the expense for shafts, &c. while the necessary preparations and other expenses were estimated at $683,314 40. It may be proper to mention, that the average elevation of this hill is only seventy yards, while that of the Allegheny, where it is proposed to perforate the mountain, is five hundred feet; and the difference in the height of the arch is also to be taken into the account. It is evident, that the longer the tunnel is, the arch must increase in height in a proportion adequate to the creation of a greater draft of air, so as to keep it pure and prevent mists.

It appears to me, that no just comparison in matter of estimate can be formed between tunnels or canals, without considering the difference of relative situation. In the construction of tunnels, the height of the mountain above the tunnel line, and the number of shafts necessary to be sunk, the nature of the contents and internal impediments, as to springs and cataracts, are all matters of importance, and tend to vary the expense, in proportion as they prevail and abound. In the case of canals, there is evidently a great difference in respect of expense between those carried along a flat level country, or gentle undulating rises, approaching to a champaign, and those constructed through broken and abrupt transversal ridges, with steep slopes, like those of the Allegheny.

On the contrary, should the works be commenced at both ends, with a view of shunning the expense of sinking shafts, &c, a new

dilemma is produced, equally if not more objectionable than the former. According to this plan, the completion of the work, even if the tunnel should be found to answer the purpose, would be protracted to so remote a period as to disappoint the views of the state, and destroy the hopes of the friends of internal improvement. The proposed scheme admits of the employment of but few hands in this subterraneous work ; probably not more than fifteen, if so many can be engaged at each end at the same time, in the business of excavation. The disadvantages under which labor of this kind must be performed are apparent. It cannot well be supposed that more than one inch (forward) per day, for each man, can be excavated, even though no obstruction should happen from meeting with springs, cataracts or other impediments. As far as experience can be resorted to for instruction, either in Europe or this country, the progress of the work has progressed with a slow pace, unless where shafts have been sunk to accellerate it, by allowing a propertionate number of miners to labor at the same time, so as to complete the whole within a given or reasonable period. The late Napoleon Bonaparte, while emperor of the French, in constructing a military road, found it necessary to cut a small tunnel through an abrupt projection of one of the Alpine mountains. Thirty one expert men from the corps of miners, were employed in it day and night, and although relieved at every eight hours by fresh hands, it required eighteen months to perforate a distance of two hundred and twenty yards. But we have an example nearer home, more striking and satisfactory than this. "At the Lehigh coal works, they are constructing a tunnel of two hundred yards in length, sixteen feet wide and nine feet high, a double set of men of twelve, each working day and night, make a foot in length, in the twenty four hours." So writes a correspondent.

As one of the canal commissioners, I respectfully submit the above report. From the imperfect manner in which it has been executed, your Excellency will perceive that I have not yet recovered from the painful illness under which I have labored since my arrival at this place.

With great consideration and esteem,
I remain, sir,
Your obedient servant.
CHARLES TRCZIYULNY.

To his Excellency John Andrew Shulze,
Governor of Pennsylvania.

Letter

From the Governor, accompanied with the correspondence with the commissioners for promoting the internal improvement of the state.

Joel B. Sutherland, Esq.
Speaker of the House of Representatives.

SIR,

In compliance with the resolution of the House of Representatives, of the 12th February instant, I have the honor to transmit to you, to be laid before the House, a draft and profile of the surveys made by the commissioners appointed under an act, entitled "An act providing for the appointment of a board of commissioners, for the purpose of promoting the internal improvement of the state," together with a copy of the correspondence of all or any of the commissioners with the executive department of the commonwealth, or with the Secretary of War.

Very respectfully,
Your obedient servant,
J. ANDW. SHULZE.

Harrisburg, February 17, 1825.

Correspondence.

[*White Horse Tavern, Great Valley, Chester county, May* 31, 1824.

His Excellency, J. Andw. Shulze.

SIR,

By a correspondence with the Secretary of War, through one of our members of Congress, Samuel D. Ingham, Esq. we have ascertained that we can get an engineer from the army of the United States, upon an application from you to the President of the United States for that purpose.

You will therefore oblige us very much by writing as soon as you conveniently can, for an engineer to be sent on as soon as possible, to join us at Downingstown, as we will be within half a day's ride of that place for two or three weeks to come.

With sentiments, &c. &c.

(Signed) JACOB HOLGATE,
JAMES CLARKE.
CHARLES TRCZIYULNY.

June 2d, 1824.

His Excellency JAMES MONROE.

SIR,

By an act of the Legislature of the commonwealth of Pennsylvania, providing for the appointment of a board of commissioners, for the purpose of promoting the internal improvement of the state, they are required to employ an engineer and such other aid or astistance as they may find necessary, to enable them to fulfil the object of the act.

The commissioners have entered on the performance of their duties, and by a letter which I have this day received from them, I am informed, that one of the United States engineers may be procured by an application from the Executive of this state to the President of the United States. Interested in the great work of internal improvements, I most cheerfully comply with their wishes, and have to request your Excellency to direct one of the United States engineers to proceed as soon as conveniently can be done, to Downingston, Chester county, in the neighborhood of which place the commissioners are now engaged. The selection of the particular individual will be with your Excellency.

Yours, &c. &c.

J. ANDW. SHULZE.

Jacob Holgate, James Clarke and Charles Treziywny, Esquires.

GENTLEMEN,

Your letter of the 31st May, was duly received, and in compliance with your request, I have this day written to the President of the United States.

With sentiments, &c. &c.

J. ANDW. SHULZE.

June 2d, 1824.

Department of War, June 8th, 1824.

To his Excellency, Governor Shulze,
of the state of Pennsylvania.

SIR,

The Pennsylvania delegation in Congress, previous to the termination of the session, addressed a letter to the President of the United States, requesting that a survey of the Susquehanna river might be made, in order to improve its navigation, and also enclosed an act of the Legislature of Pennsylvania, which authorises the Governor of the state to appoint three commissioners to explore the route of a canal between Harrisburg and Pittsburg, and that between the Schuylkill and Susquehanna, and requesting the United States engineers might aid the state commissioners in exploring these routes. The act of Congress, authorising the President to make certain surveys of the country, with a view to internal improvement, having passed just before the close

of the session, no answer could be given to the request of the delegation before the adjournment; and dispersed as the delegation now is, I have taken the liberty of communicating to you the direction of the President on these subjects, so interesting to the state of Pennsylvania.

The route between Pittsburg and the Susquehanna and Schuylkill, is deemed of importance not only to Pennsylvania, but to a large portion of the community. Thus viewed, the President has directed the board of engineers for internal improvement to co-operate with the state commissioners, if it shall be found to be practicable. The board has received instructions to make a reconnoisance, in the first instance, of the country between the navigable waters of the Potomac and the Ohio, and between the latter and Lake Erie, the performance of which duty will probably require six or eight weeks, at the end of which time they will be prepared to meet the state commissioners at Pittsburg, if you should think it proper to give orders for their co-operation with the board. It would facilitate the execution of this duty, if the commissioners of the state should first explore the route from the Schuylkill and Susquehanna to Pittsburg, and return over the route in conjunction with the board of engineers. If your excellency approves of the arrangement, and will apprise the department of your approval, measures will be taken to produce the co-operation on the part of the general government, and you will be apprised at the earliest period practicable, of the precise period at which the board will be prepared to join the state commissioners at Pittsburg. In the mean time, a direct communication might be advantageously opened between the state commissioners and the board, who have already received general instructions on the subject. By such communication, the details of co-operation might be arranged. Letters addressed by the state commissioners to the board of engineers for internal improvement, at Cumberland, Uniontown or Pittsburg, would be received by them.

Upon the other subject referred to by the delegation, I mean the survey of the Susquehanna, the President directs me to say, that although he considers the object an important one, it will not be practicable, consistently with the general arrangements adopted to carry into effect the act of the 30th of April last, under which he is authorised to make surveys for internal improvement, to cause a survey of the Susquehanna this season, as requested by the delegation.

I have the honor to be,
Very respectfully, sir,
Your most ob't serv't.
J. C. CALHOUN.

Jacob Holgate, James Clarke and Charles Trezivulny, Esquires.

GENTLEMEN,

The foregoing is an exact copy of a letter addressed to me from the Secretary of War. It will be of great use to you in

forming and arranging your plans, therefore hurry to send a copy to you, from Lebanon, without any comment for the present.

With &c. &c.

J. ANDW. SHULZE.

June 16th, 1824.

Sadsbury, June 25, 1824.

SIR,

We have come through a part of Montgomery, and through Chester counties with the canal surveys, and are now progressing through Lancaster county. But our funds are nearly exhausted. We have therefore to request you to draw your warrant on the State Treasurer for another thousand dollars. We have taken the liberty of enclosing a line to Mr. Clark, accompanied by a receipt for the money, which you will oblige us by forwarding along with your warrant.

With sincerity, we are,

Sir, your ob't serv'ts.

JACOB HOLGATE,
CHARLES TRCZIYULNY,
JAMES CLARKE,
Canal Commissioners.

His Excellency, J. Andw. Shulze.

New Holland, June 29, 1824.

His Excellency, J. Andw. Shulze,

SIR,

Yours of the 16th inst. enclosing the copy of a letter from the Secretary at War, was not received by us until this day. In conformity with the plan of the Secretary, as suggested in his letter, we have written to the United States board of engineers for internal improvement, requesting a co-operation in a reconnoisance of the propesed canal routes, and asking for a correspondence as to the time and place of meeting. We therefore request you to inform the Secretary at War of our determination, that he may give the board of engineers suitable instructions.

On the 31st ult. we requested you to make an application to the Secretary at War for an engineer to be especially detailed to assist us in the canal examinations. At a subsequent date you informed us that you had made the application. But the letter of the Secretary dont appear to be an answer to yours, but an answer to the Pennsylvania delegation in Congress, and though satisfactory as far as it goes, it is, we think, too general; it would have given us more pleasure, and we believe have conduced more to the interest of Pennsylvania, to have had one or more engineers entirely at our disposal. After suffering a disappointment in our attempt to procure a civil engineer, we regret that our application to the War Department has not been more successful, especially as two engineers and several assistants were furnished

last year to the Maryland commissioners, to survey the Susquehanna river.

Yours, &c. &c.
JACOB HOLGATE,
JAMES CLARKE,
CHARLES TRCZIYULNY,
Pennsylvania canal commissioners.

Jacob Holgate, James Clarke and Charles Trcziyulny, Esquires.

GENTLEMEN,

The foregoing is a copy of my letter, written after I had received your first communication, to the President of the United States. I thought proper to send a copy, in order that you may see that I went every length to procure an engineer, agreeably to your request. No further answer was received, except the communication from the Secretary of War, a copy of which was forwarded to you, and acknowledged in your last. Mr. Harris, a member of Congress of Dauphin, informed me since, that no engineer could be procured from Washington, sooner than in the month of September.

Respectfully, &c. &c.
J. ANDW. SHULZE.

July 3*d*, 1824.

The Honorable John C. Calhoun, Secretary of War.

SIR,

The annexed is an extract of a letter† addressed to me, from the Pennsylvania canal commissioners; a correspondence from the state commissioners, it appears, was commenced with the board of engineers of the general government, consequently the details of co-operation may be better arranged. The commissioners are fully authorised to employ an engineer, and such other aid or assistance as they may find necessary to enable them to fulfil the object of the act. I feel much interested in the great work of internal improvement, therefore most cheerfully comply with their wishes, and have to request you to direct the board of engineers to join the commissioners of this state, at such time and place as will be found most convenient.

Yours, &c. &c.
J. ANDW. SHULZE.

July 21, 1824.

SECRETARY'S OFFICE, August 5th, 1824.

GENTLEMEN,

Enclosed I transmit to you the copy of a letter this day received from the Honorable J. C. Calhoun, Secretary of War. It will be for you to take the necessary measures to carry into effect

† See letter from commissioners to Governor, under date of June 29, 1824.

the object in view, in which it is conceived the state is much interested. We will thank you occasionally to inform this department of the progress you are making, and the place to which our communications may be directed.

Very respectfully,
Your o'bt. servant,
MOLTON C. ROGERS.

JACOB HOLGATE,
JAMES CLARKE,
CHARLES TRCZIYULNY, } Esquires.

DEPARTMENT OF WAR, July 29th, 1824.

SIR,

I have the honor to acknowledge the receipt of your letter, of the 21st inst. and to inform you that the board for internal improvement has been required to afford, as early as practicable, its co-operation with the commissioners of the state of Pennsylvania, in exploring the route for a canal between Pittsburg and the Schuylkill and Susquehanna.

I have the honor to be, sir,
With the greatest respect,
Your most ob't. servant,
J. C. CALHOUN.

His Excellency J. Andw. Shulze,
Governor of Pennsylvania, Lebanon.

DEPARTMENT OF WAR, August 9th, 1824.

SIR,

I have the honor to transmit herewith for your information, a copy of a letter just received from the board of internal improvement, on the subject of their co-operation with the state commissioners of Pennsylvania, in exploring a route for a canal between the Allegheny and the Susquehanna and Schuylkill rivers.

I have the honor to be, sir,
With the greatest respect,
Your most ob't. servant,
J. C. CALHOUN.

His Excellency J. Andw. Shulze,
Governor of Pennsylvania, Lebanon.

Union Town, July 28th, 1824.

Major General A. Macomb,
Chief Engineer, Washington, City,

SIR,

In answer to a letter from the engineer department, calling for information as to the time when we shall be enabled to afford our co-operation in exploring the route of a canal between the Schuylkill and Allegheny rivers, we have to state, that it is impossible now to fix the period of the termination of our present la-

bors with any precision, though we presume they will occupy us till about the 10th of September. As we progress, however, we shall be able to make more accurate calculations with reference to that period, and will not fail to notify the Pennsylvania commissioners, (with whom we have already opened a correspondence,) in due season, of the time when we can join them. It is much to be desired that the preliminary surveys along that route may be completed before we enter upon it, otherwise our examination would be of little avail.

We have the honor to be,
Sir, very respectfully,
Your most ob't. servants.
BERNARD, Brig. Gen.
JOS. G. TOTTEN, Maj. Eng. Bt. Lt. Col.
JOHN L. SULLIVAN,
Members of the board of internal improvement.

Office of the Secretary of the Commonwealth of Pennsylvania,
Harrisburg, August 14th, 1824.

GENTLEMEN,

By direction of the Governor, I send you for information, copies of letters just received by him from the War Department at Washington; of which I will thank you to acknowledge the receipt, as soon as conveniently may be.

I am, respectfully, your friend,
JAMES TRIMBLE,
Deputy Secretary.

JACOB HOLGATE,
CHARLES TROZIYULNY,
JAMES CLARKE, Esq.
} *State Commissioners.*

Lancaster, August 20, 1824.

His Excellency J. ANDW. SHULZE,

SIR,

After much labor, we have at length discovered what we believe will make a good route for a canal through Lancaster county. It will leave the great valley at the Gap, pass down, and then over the Pequea, Mill creek, and Big Conestogoe, and close by the city of Lancaster; thence up and over Little Conestogoe, and across the Big Chickeys, below Manheim, and enter the Susquehanna at any point above the Conewago falls that may be found most convenient. This route will have two summit levels; but it will pass through the heart of Lancaster county, with a plentiful supply of water, that can be increased to any amount which may ever be needed, by two feeders of a few miles—one to each summit—that will do for lateral canals. Although our surveys in this county are not yet completed, we are making arrangements to have them finished this season. While Mr. Clarke and myself sets off immediately to the west, to meet the United States' board

of internal improvement, and if possible have something done on the western surveys this fall yet.

Yours, &c. &c.

JACOB HOLGATE,
President of the Board of Commissioners.

SECRETARY'S OFFICE, August 20th, 1824.

JOHN C. CALHOUN, Esquire,
Secretary of War.

SIR

The commissioners of Pennsylvania have to regret that they have not received that assistance from the United States engineer corps that they had reason to expect, from communications from Washington, before and after the passage of the act of our Legislature. We, however, have no doubt, that this has heretofore arisen from causes not under the control of the government, and we would earnestly request that one or more assistants should be detailed for this service, whenever it can be done consistently with the interests of the United States.

The Pennsylvania commissioners intend proceeding immediately to the west, in order to commence a survey of the routes passing through this state, between the Susquehanna and the Lakes. It is generally believed that the routes through this state, are equal, if not superior to any others in the Union, for the connecting links of the western with the Atlantic waters. Hence it is, that we feel more than ordinary solicitude, that this important subject should be presented to Congress at the next session, with all the weight which a favorable report from the board for internal improvement would attach to it. Congress cannot act with due regard to the true interests of the country, without surveys, &c. of the intermediate ground within the limits of Pennsylvania, between the Susquehanna river and Lake Erie. It has been observed, with some degree of surprise and regret, that the board of internal improvement intend to confine themselves to a mere reconnoisance of the ground, between the western waters and the Susquehanna. This will certainly not prove satisfactory to the citizens of this state, as from the best information we have been able to obtain, the routes contemplated are of national importance in a commercial and military point of view, and as such directly within the meaning of the act of Congress, passed at their last session. Will you, sir, have the goodness to submit this matter to the consideration of the President, that he may, in his discretion, give the necessary orders to the board of internal improvement, and in time to complete the survey, plans and estimates, before the next session of Congress? The commissioners of this state will afford every practicable aid in effecting this object, important to the Union, and more particularly so to this commonwealth. They will proceed immediately to the west to view the ground,

in the confident expectation that they will be joined and effectual assistance given them by the United States commissioners.

Very respectfully,
Your ob't. serv't.
MOLTON C. ROGERS.

Laughlinstown, 7th September, 1824.

MOLTON C. ROGERS, Esquire,
Secretary of the Commonwealth.

DEAR SIR,

Agreeably to an arrangement with colonel Holgate, I should have met him this day, at the house of John Blair, Esq. in Huntingdon county. But just as I was ready to set off, yesterday, to meet him, I received a letter from a col. John Ramsey, who keeps a tavern in Pittsburg, stating that the United States board of internal improvement was at his house, (on the 3d instant,) waiting on our arrival. I therefore immediately despatched a man and horse to col. Holgate, to apprise him of the fact; with a request to meet me as soon as possible at Pittsburg, while I proceed direct by the stage. I expect to be in that city by noon, on Thursday, and that Mr. Holgate will reach it on Friday evening.

The Honorable J. C. Calhoun is expected at Pittsburg in a few days, and preparations are making to give him a public dinner.

With great respect, I am,
Your ob't. serv't.
JAMES CLARKE.

WAR DEPARTMENT, September 10, 1824.

SIR,

Your letter of the 20th of August was received at the department during my absence, which has prevented an acknowledgment of it till this time. I should regret exceedingly if any circumstance should prevent the co-operation of the board of internal improvement with the Pennsylvania commissioners, in making a reconnoisance of the route of the projected canal between the western waters and Susquehanna. Every measure had been adopted on the part of this department to produce the co-operation, and I learn by letter from the board of internal improvement to the Pennsylvania commissioners, (a copy of which is enclosed,) that the former had addressed the latter on the subject of their co-operation, fixing the time and place, but had received no answer, although the board had taken the precaution of sending duplicates of their letter to Harrisburg, Lewistown, Ebensburg and Frankstown; so that you will perceive that if the co-operation has not taken place, it has been owing to some accident beyond its control. I still, however, hope that the commissioners and the board will form a junction at Pittsburg, as it appears by

your letter that the former would set out in the execution of its duty in the latter part of August, and as it appears from the letter of the board to the engineer department, it will be ready to co-operate with the commissioners by the first of September, which I trust will be in time to form the junction. You express your regret that the board of internal improvement were directed to confine themselves to a mere reconnoisance of the route, without making a survey, and the desire that the order should be extended to the latter as well as the former, and that measures should be taken to complete the surveys, plans and estimates of the route, in order to lay it before Congress at the next session. I concur with you in opinion, that routes between the Susquehanna and the western waters should be carefully examined, and if the result of such examination should prove favorable, that a survey, with plans and estimates, should be made before a final decision be made by Congress, on the projected route between the Chesapeake and the Ohio. But it will be utterly impossible to make the surveys this season, even should the reconnoisance prove favorable to the route; all of the disposable officers of the topographical corps, with such details as could be spared from the artillery, are now engaged in surveying the latter route, and there is no prospect that it can be completed this season. It is a work of immense labor, and will require another season to complete it in a suitable manner to be laid before Congress, and consequently the plans and estimates cannot be submitted to Congress before the session ensuing next. Should the reconnoisance of the Susquehanna route prove favorable, the government will cheerfully co-operate with the state of Pennsylvania, in making the survey and forming the plans and estimates; and it is hoped, as there will be a greater number of topographical engineers disposable the next year, both routes may be brought before Congress next year.

It is due to the nation, that works of so much importance and expense should not be undertaken, but on the most mature deliberation, founded on the most careful survey, and a minute comparison of the relative advantages of all the routes which may be deemed practicable.

I have the honor to be,
Very respectfully,
Your ob't servant,
J. C. CALHOUN.

Molton C. Rogers, Esq. Secretary of State, Lancaster, (Penn.)

Copy of a letter of the Board of Internal Improvement, to Jacob Holgate, Charles Treziyulny and James Clarke, Pennsylvania Canal Commissioners.

GENTLEMEN,

We embrace the first opportunity we find, of being able to appoint the time and place of meeting, requested by your letter of the 29th of June, and to which we answered on the 15th ultimo.

We will be at Pittsburg on the first day of September next, and prepared to co-operate with you, according to the orders of the Secretary of War.

We have the honor to be,
Gentlemen, very respectfully,
Your most obedient servants.

Signed by the Members of the *Board of Internal Improvement.*
17th August, 1824.

Lancaster, 11*th* ———, 1824.

DEAR SIR,

On the 20th of last month, Messrs. Holgate and Clarke left me 110 dollars, to pay the current expenses of eight hands; this, and besides my own, is expended. Finding that I have to stay a longer time on this side the Susquehanna than was first calculated, I went to this city in order to communicate my situation to the Secretary of this commonwealth:—Through his aid I obtained a loan of 150 dollars from Mr. Nathaniel W. Sample, jun. by giving my note payable in 30 days. I therefore beg the favor of you to draw your warrant on the Treasurer for $300, one-half to be accounted with Mr. Sample, in his favor, and the other half to be drawn by me, or order, on demand.

With sentiments of esteem and respect,
I have the honor to be,
Your humble servant,
CHARLES TRCZIYULNY.

His Excellency John Andrew Shulze,
Governor of the State of Pennsylvania.

Pittsburg, 11*th September*, 1824.

SIR,

For the information of the Governor, we have to state, that we arrived here on Thursday, and met with the United States board of internal improvement, consisting of three principal engineers and three assistants, making six gentlemen, who will accompany us to the eastward, and who are directed to co-operate with us, and to report to us as to their proper department. We are all to set off from here on Monday morning, and will proceed by the Allegheny, the Kiskiminatas, the Big and Little Conemaugh rivers, to the Allegheny mountain, which we will cross over, and descend the Juniata and the Susquehanna, to Conewago falls; and thence by Lancaster city to Philadelphia. They travel from twenty to thirty miles a day. They have to be in New-Jersey as soon as possible, and will not now have time to examine any other of our proposed canal routes. Letters addressed to Blair's Gap, Huntingdon county, would propably meet us.

We are, very respectfully,
Your obedient servants.
JACOB HOLGATE, } *Penn. Canal*
JAMES CLARKE, } *Commiss'rs.*

Molton C. Rogers, Esq.

HARRISBURG, *September 27th*, 1824.

His Excelleney J. Andrew Shulze.

SIR,

We wish you to give the State Treasurer a warrant for seven hundred dollars, which will complete the fourth thousand that we have drawn for on account of the Pennsylvania canal surveys. While Mr. Trcziyulny has been engaged with the surveying company in Lancaster county, Messrs. Holgate and Clarke have repaired to Pittsburg, and there met with the United States board of internal improvement, and in company with them, have examined the rivers Allegheny, Kiskiminatas, Conemaugh, Juniata and Susquehanna to this place; and they find the prospects of getting a good route for a canal very good indeed. Col. Holgate will accompany the United States engineers to Philadelphia, and Mr. Trcziyulny a part of the way, while Mr. Clarke will go with the company to make some surveys on the Allegheny mountain this fall yet.

We are, very respectfully, &c.

(Signed,) JACOB HOLGATE,
JAMES CLARKE.

BLAIR'S GAP, Huntingdon county,
November 3d, 1824.

SIR,

Since we came to the mountain, we have been so very busily engaged as to neglect our correspondence :—You will please to receive this as an apology for not keeping your department advised of our proceedings more regularly.

Col. Holgate accompanied the United States engineers to Philadelphia, and there received from them written instuctions relative to running a number of experimental lines, and measuring streams, before they could report to us their opinion of the route for a canal through Pennsylvania. Finding it impossible for one company to do all that should be done before the setting in of cold weather in the Allegheny, we organized another small party under general David Milliken, of Lewistown, and set them to survey several streams which issue out of the mountain. They have performed the service that we required of them, and are discharged; and our old company will be also done at the mountain this week, with all that is deemed necessary at this time, when we will direct them to take the level of the Juniata and the Susquehanna, from thence to Harrisburg.

It is with great pleasure we can inform you that the prospects of getting a good route for a canal, by the way of the Juniata and the Conemaugh rivers, far exceed our most sanguine expectations. But the Allegheny mountain will have to be passed by a portage of five or six miles, or by a tunnel, which may be any length, from two and a half to four or four and a half miles. A portage may be adopted in the first instance, until the public shall be satisfied as to the immense utility of a canal, and until the profits of a canal can bear the expense of constructing a tunnel. Although water enough may be

secured to a summit level, for a tunnel of two and a half miles in length, yet the immense lockage that will be saved, combined with other advantages, by extending the tunnel to four miles, will make that length of tunnel much the cheapest.

Our levels have shewn us, that a tunnel of four miles would pass about seven hundred and fifty feet below the summit of the mountain :—Thus cutting off at once fifteen hundred feet of lockage, which would cost one and a half million of dollars; whereas a tunnel of four miles, at the usual estimate, will not cost more than half a million of dollars. This will reduce the whole lockage, between Harrisburg and Pittsburg, to about two thousand feet; and at this level, on actual measurement of the streams, which can readily be carried into the summit level, now, when they are very low, gives better than forty cubic feet per second.—A quantity sufficient to feed two such canals as that of New-York.—But, besides this great abundance of running water, there could be reservoirs made for a trifling expense, to contain many thousand lock fulls of water.

It must be gratifying to every Pennsylvanian, to know that we have unquestionably the best route for a canal between the eastern and western waters.

We expect to be in Harrisburg in a few weeks, when we will give you a more full statement of our proceedings.

We have the honor to be,
Your obedient servants.

JACOB HOLGATE, } *Penn. Canal*
JAMES CLARRE, } *Commiss'rs.*

Molton C. Rogers Esq.
Secretary of the Commonwealth.

Harrisburg, December 3d, 1824.

SIR,

We expect our surveying company here in a few days, when we will settle off with them for the season. But to enable us to do so, we have to request your Excellency to give us an order on the State Treasurer for another thousand dollars.

We are,
Your Excellency's ob't. humble ser'ts.

JACOB HOLGATE,
CHARLES TRCZIYULNY,
JAMES CLARKE,
Pennsylvania Canal Commissioners.

J. ANDREW SHULZE, Governor.

military services rendered by her late husband in the revolutionary war. Your committee have investigated this case maturely, and found that the petitioner was not married to her late husband (Michael Wislar) while he was in the army, but some weeks after he was discharged. Your committee deem the principle well settled, that the widows of old soldiers who were married to them while they were in the service of their country, are only entitled to a pension, in consequence of the sufferings and privations incident to their peculiar condition, in being deprived of the society of their natural protectors and the peculiar anxiety of mind which such a situation must naturally have produced.

Your committee therefore offer the following resolution,

Resolved, That the committee be discharged from the further consideration of the subject, and that the petitioner have leave to withdraw her petition and documents.

No. 161.

Report of the committee on the militia system, on the claim of Henry Betz,

READ, February 23, 1825.

Mr. Cummings, from the committee on the militia system, to whom were referred the petition and documents of Henry Betz, of Berks county, praying that a certain account filed in the Auditor General's office, may be paid to him, made the following report, viz.

That they have carefully examined into the case of the petitioner, and find, that the account for which he petitions for payment, is one that is properly payable to Jeremiah Shappell, brigade inspector of 2d brigade 6th division, and the amount of seven hundred and ten dollars and fifty cents, *have been so allowed to the said Shappell*, as will appear by a settlement made of his account for the same period, and so entered in the Auditor General's office, on the 14th day of October, 1824, after deducting the sum of 74 dollars, on account of errors in said account; and a balance still remained due to the commonwealth, of the sum of ninety-nine dollars and twenty cents.

Under these circumstances of the facts, as well as it does appear that the militia officers have given their receipts in discharge of the said brigade inspector, and for which he has received the credits lawfully due to him, your committee cannot see any cause whatever, why the Legislature should interpose in favor of any individual, who may voluntarily interest himself by the purchases of such public accounts as may *even* stand open for future settlement, between any public officer and this commonwealth.

Your committee therefore offer the following resolution.

Resolved, That the committee be discharged from the further consideration of the subject.

No. 162.

Report of the committee of ways and means, relative to taxing monies loaned on bonds and mortgages, and capital invested in stock.

READ, February 23, 1825.

Mr. Gilleland, from the committee of ways and means, made the following report, viz.

The committee of ways and means having been directed by this House "to enquire into the justice and expediency of taxing all monies loaned on bonds and mortgages, and all capital invested in stock," respectfully submit their views relative to that subject.

The latter part of the proposition being essentially different from the first, ought to be considered separately.

As the abstract justice or injustice of a tax on bonds and mortgages, involves questions too complicated and abstruse to be properly discussed within the ordinary limits assigned to a legislative report, your committee believe, that without pursuing such an investigation, it may be satisfactorily shewn that such a tax would, under present circumstances at least, be extremely inexpedient.

Your committee are of opinion, that it would increase the pressure of pecuniary embarrassments upon the people, by inducing many persons to draw in their outstanding debts; that it would weaken the moral feeling of the community, by the temptations it would hold out for the commission of frauds and perjuries; that it could not be levied, but by the adoption of regulations full of revolting novelty, and leading to a general interference of government with the private concerns of individuals, which would be repugnant to the habits and prejudices of the people, and to the whole tenor of our system of jurisprudence.

In a country like France, where the ordinary transactions of business are conducted under the special superintendance of government, where the officers of justice and of police exercise the functions of acting partners in every commercial concern, there might be nothing irksome in the inquisitorial examinations which the project submitted to us would necessarily require:—But, to a people educated under customs like ours, so artificial a system would be manifestly intolerable.

The tax proposed can only be considered in the light of a property tax; and as bonds and mortgages are not property in the full sense of the term, but merely evidences of a right to property, or *choses in action*, that is, rights not reduced into posses-

sion, it can scarcely be considered equitable to charge people for property which they do not possess, and which, in many cases, they may be absolutely unable to recover. All property taxes are of course *ad valorem*. Now the real value of a bond depends not altogether upon the amount for which it has been given, but on the credit and condition of the obligor, and on the stipulations with which it may happen to be encumbered;—to appreciate all which would be a task of such delicacy and difficulty, as no public officers could be prudently invested with a discretionary power extensive enough to execute.

If a tax could be levied, in an unobjectionable manner, directly and virtually from those holders of bonds and mortgages, who yearly receive interest upon their advances, it could hardly be obnoxious to the complaints of any class. But interest is scarcely ever periodically paid upon mortgages, and where it is paid upon bonds the impost would be futile, for, by the simplest operation imaginable, it could be evaded; or, if it were not evaded, the practical consequence of it would always be to throw the charge upon the persons obligated. All commercial practice—the general understanding of men in regard to all the charges incident to pecuniary transactions, abundantly assure us that such would be the result.

Now, it must at least appear strange, that the circumstance of a man borrowing money, should be taken as a criterion of his peculiar ability to undergo a tax, or of his being a capitalist in the enjoyment of an extra measure of governmental protection.

In Great Britain, (to which we naturally look for experimental knowledge in all matters connected with the subject of taxation,) there never has been any tax levied like that supposed to be contemplated by the resolution submitted to your committee. It is true, that in that kingdom taxes are laid upon mortgages and other deeds, upon bonds and other promissory notes and bills of exchange, on receipts of various kinds, on testamentary inventories, on probates and on most written instruments used in law proceedings; but they are levied by stamps. They are, therefore, charges upon the transmission of property, and on process in courts of justice simply, and have no reference to capital or income, or to a capacity to undergo taxation.

As your committee do not consider themselves called upon by the resolution to enquire into the expediency of imposing stamp duties, they decline giving any opinion at present upon that subject.

With regard to "capital invested in stock," it has already been recognized as a proper subject of taxation in the law which requires a per centage upon bank dividends. The bill lately reported to this House for "taxing insurance companies," embraces the same principle; and your committee are of opinion that it may be advisable to extend it to other objects of the same description.

No. 163.

Letter from the Governor, accompanied with a report of Charles Trcziyulny, one of the board of commissioners for the purpose of promoting the internal improvement of the state.

READ, February 23, 1825.

To the Senate and House of Representatives of the commonwealth of Pennsylvania.

GENTLEMEN,

I have the honor of transmitting to you the report of Charles Trcziyulny, Esquire, one of the board of commissioners, appointed in pursuance of the act of the 27th of March, 1824, entitled "An act providing for the appointment of a board of commissioners, for the purpose of promoting the internal improvement of the state."

J. ANDW. SHULZE.

Harrisburg, February 23, 1825.

No. 164.

Report of Charles Trcziyulny, Esq. one of the board of commissioners for the purpose of promoting the internal improvement of the state.

HARRISBURG, February 21*st*, 1825.

SIR,

Agreeably to the purport of a letter, which I had the honor of addressing to you, on the ninth instant, I now proceed to give your Excellency a condensed narrative or report of the levelling and surveys of the routes for certain proposed canals, so far as I was personally engaged during the past summer and autumn, as one of the commissioners, under an act of the Legislature, passed the 27th day of March, 1824, by such topographical observations and remarks as may be deemed pertinent to the subject, or tend to elucidate it.

Upon the completion of various preliminary arrangements, and the failure of the commissioners to employ Mr. Strickland, as engineer, conducted chiefly by my colleagues, we repaired in the month of May to the mouth of Valley Forge creek, in Montgomery county, accompanied with Mr. Siddal, a scientific and experienced surveyor and leveller. Here Mr. Siddal began his operations, and commenced a series of levels to the Gap tavern, for the

distance of thirty-five miles or thereabouts, partly on the north side and partly on or near the middle of the Great Valley, in Chester county, and chiefly through a limestone soil, of undulating or rising ground. On reaching the Gap, it was found to be five hundred and eighty-seven feet above tide at Philadelphia. After ascertaining this fact, it was agreed to sink the Gap seventy-two feet and overcome it by a tunnel, instead of cutting down, about half a mile in length being necessary to carry the canal into Lancaster county, as contemplated by the act of Assembly. From the Lancaster side of the Gap, the levelling proceeded towards the city of Lancaster, under the direction of the board, for eight or ten miles of descending land, and principally along the side of the Gap Hill, where we entered a limestone valley of rolling ground, the hills or ridges crossing our course. Judging, from the appearances and indications of the country, that it would require deep cuttings to overcome these heavy sections, the leveller was directed to return to the Gap, and try for a more favorable route in a direction to Lancaster, or as near it as might be practicable. Accordingly, a new series of levels was taken from the Gap, in a direction to New Holland, and with the same intent. The result of this proved more unfavorable than the former experiment. The course of levelling was then changed towards Ephrata, principally following the road, and from thence along the road to New Ephrata, where we stopped on the top of a ridge, and benched on an oak within sight of the latter village. The whole country, from the Gap to the bench, abounds with limestone ridges and hills, is exceedingly fertile, well cultivated and handsomely improved, but presents no encouragement for the location of a canal. The project of a route in this direction was of course abandoned. On suggesting the probability of finding a more promising route along the Welch Mountain for a continuation of a canal, from the Gap to a point opposite the Juniata, or near it, *above all the worst of the falls*, and to proceed by the way of Harrisburg, we returned to the Gap, on the north side of the ridge. To accomplish this object with the most effect, it was my advice to carry the summit level as far as practicable, with a view of obtaining a greater power of water, by intersecting the river as high up as possible and avoiding lockage. To this my colleagues appeared to consent, while Mr. Siddal, the leveller, gave the scheme his entire approbation. He therefore commenced at the Gap again, having already established the bottom of the tunnel line to be five hundred and fifteen feet above tide, the levelling and surveying was conducted on the principle of preserving *this height* round the Welsh Mountain, near the foot of the same, so as to take in all the branches of the Pequea creek, and the creek itself. Pursuing this route for more than twenty miles, a new dispute arose between one of my colleagues, Mr. Clarke and Mr. Siddal, when the latter became so much displeased as to retire from his employment; a circumstance which I much regretted. Previous to this occurrence, Mr. John Thom had been engaged in surveying and levelling some streams to their

sources:—he was now sent for to occupy the station relinquished by Mr. Siddal. We then proceeded on the principles already stated, sometimes with Thom's instrument, both old and shackling, and sometimes with the new level purchased by the board, and continued the same summit level round the Welsh Mountain, and up the Conestogoe valley, keeping near the mountains and ridges, and taking in all the branches of the Conestogoe creek, (and the creek itself may be taken in,) as also Muddy creek, Cocalico, Indian creek, Middle creek, Furnace creek, Hammer creek, Chickasalungo and Conewago, with their several branches, to near James Kelly's tavern, about eighteen miles from Harrisburg, where we benched on an oak, making an entire distance of eighty-five miles from the Gap. Pleased with the favorable aspect of the country, it was my determination to extend the summit level farther, not only in this direction, but also from the Gap towards the city, when on a sudden the senior commissioner (Col. Holgate) made his appearance at Kelly's tavern, and ordered the leveller and hands to repair immediately to Harrisburg, and join Mr. Clarke, the other commissioner, while I accompanied him to Elizabethtown. We arrived there the same night, when I was introduced to the gentlemen composing the board of the United States engineers. The following morning we started for Manheim, where the board examined Hammer creek. In the afternoon we proceeded towards Lancaster, through an undulated range of limestone country, in a high state of cultivation, some of the ridges of considerable elevation, and limestone rocks running near the surface across our course. At night we reached the city, when Scott's map of Lancaster county was produced, and a conversation took place respecting certain routes, in which our views were stated to the board of engineers, but differing in judgment among ourselves, no opinion was expressed by them, as to the future location of the route most proper to be adopted through Lancaster county. Seeing no prospect of coming to a decision, as to this matter, we separated next morning, Col. Holgate accompanying Gen. Bernard and the rest of the board to Philadelphia, while I hastened after the leveller to the Alleghenny mountain, by the way of Bellefonte, near which my family resided.

Although thus interrupted in my views of finishing the exploration of the remainder of the route, it may nevertheless be proper for me to state, that during its progress, no obstructions appeared to my mind which may not be surmounted, and that without encountering any serious difficulty, or incurring any expense which the magnitude of the object will not justify, while some of them may be altogether obviated or removed by a *judicious* location.

The preservation of a summit level, for so great a length as eighty-five miles and upwards, with forty-five feet breadth on the surface and thirty feet at the bottom, and with four feet depth of water, is of itself an important circumstance. But there are other considerations which deserve attention. Among these may

be noticed the abundance and certainty of the supply of water, even in the driest season, from so many streams (some of them powerful ones) heading in the mountain and running from its base into the proposed summit level, without the expense of feeders, or artificial reservoirs, the saving of lockage, and the retentive quality of the ground through which it would pass being composed of a gravelly-clay soil. To these may be added, the superiority or preference in point of expense and ease of excavation, possessed by canals constructed along the sides of hills or mountains where the slope is not too steep, over those carried through a flat limestone country. The comparative inconsiderableness of damage to farmers, millers and nonmasters, owning the lands through or near where it may pass, is a consideration not to be overlooked. Feeders and reservoirs are not only expensive in their formation, and repairs but generally tend to destroy the water powers of mills and works below them, while the erection of waste weirs will be an effectual means to prevent an overflow of water from the summit level, and for returning the surplus into its original bed. The appropriation of the surplus power of water, which a canal thus constructed will afford to manufacturing purposes, and for feeding lateral branches to the city of Lancaster, and other places and districts more remote, is a matter of no small consequence, in a state where a laudable spirit of encouraging manufactures and internal improvements begins to manifest itself. Such considerations, if duly appreciated, will, it is apprehended, more than compensate for its circuitous location. But the view now presented is not intended to give this route any preference at present over others, which remain unexplored, as no conclusive opinion can be formed until the other routes by the head waters of the Schuylkill shall be viewed and examined.

It is difficult for me, at present, to accompany this report with an estimate of the probable expense of completing this canal. The whole route has not been yet explored, and of the part surveyed and levelled for exploration, extending about eighty-five miles, no actual location has taken place, nor was it in my power to accomplish the location with a single leveller during the time I remained in those parts: But was I to hazard an opinion, I might say the average cost of each mile would not exceed twenty thousand dollars.

After resting with my family for a few days, I proceeded to the Allegheny, and joined my colleague, Mr. Clarke, at Blair's tavern, near the mountain. We measured several branches of the waters of the Juniata, though in an imperfect manner, for the want of a stop watch, pointing out the seconds. Col. Holgate arriving at this time, we started across the Allegheny in search of other streams, and to ascertain how Mr. Thom and the hands were coming on. We came to Lilly's mill, on the west side of the mountain, near the tunnel line, where Mr. Thom was engaged in protracting the different courses and distances from the commencing point, as exhibited on the plan by a red line, (explained by the reference,) over the mountain to Lilly's mill. There I

learned of him, that one of the chain carriers, Mr. John Gerhart, had been ordered by Mr. Clarke to take the level in his place. After entering on his new employment, he run for a feeder route some miles on the west side of the mountain, as marked in the map. Shortly after this Mr. Thom resumed his station, and finished the feeder route, measuring twenty miles and some perches, under the direction of the board; a good part of it on steep sideling spurs of the mountain. Mr. Thom, by the direction of the board, now took a series of levels from a point in the feeder route, and run to the mouth of the south branch of the Conemaugh, in order to ascertain the fall from the tunnel, also marked on the plan in red. We then returned to Lilly's mill, where the commissioners were. It was proposed by me that the tunnel line should now be run, to which my colleagues assented. The clouds indicating a change of weather, we stopped after levelling part of a day, and proceeded to ascertain and fix the site for the reservoir, likewise marked in the plan:—The face of it is chiefly a thicket of laurel. As soon as it was finished, we commenced again at the point on the tunnel line where we left off, and continued to run the course and take the levels thereof for drawing the profile. On completing the tunnel line, Mr. Thom's correctness as a leveller appeared evident, from his benching within something more than a foot of his former levellings, and corresponding with a calculation of the heights, of which the reckoning had been kept by me. The tunnel line measures four miles and one hundred and twenty-seven perches, as the plan will shew.

About the middle of November my two colleagues took their departure for Harrisburg, after directing Mr. Thom, and requesting me, to repair to the same place. On our leaving the Allegheny, Mr. Gerhart, one of the chain carriers, was promoted to the station of leveller, and appointed to take the command of the party. The new leveller proceeded with the hands, as I understood, to level and direct the survey from the junction of Blair's creek with the Juniata, to Harrisburg.

In taking the levels and surveys from the junction of Blair's creek and the Juniata, by Mr. Thom, under the direction of Mr. Clarke, before my arrival, the points of the tunnel were then established, including the seventy-seven perches, with a fall of one hundred and forty-three feet, from the east end of the tunnel line to the sugar maple bench, as explained by the plan.

On refering to the profile in the plan, the height of the bottom of the tunnel line, will be found to be nine hundred and forty-five feet above the mouth of Blairs creek, and the distance about eight miles, requiring one hundred and eighteen locks to overcome this distance; the summit of the mountain seven hundred and fifty-four feet above the proposed tunnel line, varying, however, from seven hundred and fifty four to eighty-five feet, the lowest indenture in the mountain; the whole averaging about five hundred feet. In short, the whole country, from the upper forks of the Juninta, to the forks of the south branch of the Conemaugh, is mountainous; mountain rising after mountain, in quick succession.

The main one, where the proposed tunnel is to pass, is hemmed in, and surrounded by other high mountains with steep slopes, separated from one another by narrow ravines, and presenting no favorable situation for canalling, either by lockage or tunnelling. Here nature has refused to make her usual kind advances to aid the exertions of man; mountains are thrown together, as if to defy human ingenuity, and baffle the skill of the engineer.

It would be my wish to conclude the present narrative, already too far extended by the relation of incidents attending the progress of this exploration, some of them of little interest, without expressing any opinion as to the practicability of the mountain section; but as I have not united with my colleagues, in the report submitted by them to your Excellency, a necessity devolves on me to add a few observations on the tunnel line, the most critical barrier in the proposed route, and the only part levelled and surveyed from point to point.

An eminent writer on canals, says "when it is proposed to form any canal, the choice of a skilful and experienced engineer is an object of primary consideration. Without due attention to this object, many impracticable projects may be adopted, and large sums of money may be expended, without accomplishing any important and useful purpose." The failure of the commissioners to procure an engineer, to assist them in fulfilling the objects of their appointment, was much regretted, on the outset. During the progress of the examination, subsequent events have convinced my mind, not only of the utility of such an officer, but of the loss sustained by the commonwealth, and which must always be sustained, from the want of one. Without the aid of a competent and independent engineer, to consult with on the present occasion, it is difficult for me to express my sentiments on this subject, with the same confidence as might be done had I possessed the advantage of his advice. I feel, therefore, the delicacy and responsibility of the situation in which existing circumstances place me. But I feel also the obligation, which a sense of duty enjoins upon me to proclaim in unequivocal terms, the result of my own judgment of the matter, whatever it may be, uninfluenced by any consideration arising from a difference of opinion with others.

Judging with due deliberation, from facts ascertained by levels and surveys, and regarding them as the only safe ground of conclusion, I cannot but consider the proposed project of tunnelling the Allegheny mountain, for four miles and a half, as an experiment full of doubts, difficulties and perplexities, wholly inexpedient to venture on, even if practicable, unless I am greatly mistaken in my apprehension as to the cost of such an undertaking. I do not stop here. In my opinion, the measure is utterly impracticable, considering the physical difficulty of execution, and the magnitude of expense which it will involve. I cannot see how the fall of one hundred and forty-three feet, in the distance of seventy-seven perches, as surveyed and levelled, and marked in the plan, can be overcome by lockage, when the boat is proposed to be eighty feet long, and eighteen locks of eight feet lift

in one straight tier are required. Should a project be resorted to for overcoming this fall, by sinking the tunnel line one hundred and forty-three feet below its present depth, nearly striking the sugar maple on the east, and the ash tree on the west, the necessary consequence will be, an increase of one hundred and forty-three feet to the height of the mountain, above the tunnel line, at different points of elevation, and consequently the same increase, to the depth of the shafts necessary to be sunk, making the depth at the highest part of the mountain, eight hundred and ninety-seven, instead of seven hundred and fifty-four feet. It must, likewise, have the effect of adding three miles or nearly so, to the present length of the tunnel, that is to say, seventy-seven perches on the east, to the sugar maple, and seven hundred and thirty-six perches on the west, to an ash bench marked in the plan. The expedient of extending the tunnel line through the mountain, opposite the east end of the proposed tunnel, or of winding round the faces of mountains, to reach the point at the sugar maple bench, or of pursuing a serpentine course round mountain after mountain, so as to arrive at any given point below the sugar maple, will be attended with much difficulty, greatly increase the distance and expense of lockage, and prove more intricate and still less feasible, than the experiment of sinking the present tunnel line.

To make any estimate, in detail or in gross, of the cost of the proposed tunnel of four and a half miles, through the Allegheny, is far beyond the means of calculation possessed by me at present, unless I should substitute conjecture for fact. The contents of the mountain are unknown, and have remained undisturbed since the creation of the world Before any calculation can be made, for estimating even the probable expense, an engineer must be furnished with the requisite local information, by sinking experimental shafts. The number and depth of the shafts, for raising the stuff, pumping the water, and ventilating the tunnel, should be ascertained, and whether galleries be necessary, and side chambers wanted to save the workmen in time of blasting, without being hoisted to the top, or retreating at the mouth. A knowledge of the soil, mineral substances, and all the variety of rock and matter of which the mountain is composed, would be useful; whether there be any subterraneous chasms, springs or cataracts, and the number of headings or saughs, for draining the water, and preventing it from incumbering or drowning the labourers, as also the masonry, that may be required, the number, power and expense of steam engines, for raising the water, stones, &c. from below. These provisions are all essential preparations, before the work of the tunnel can be conducted throughout, either with safety to the workmen, or ensuring the expedition and permanency of the work. General Bernard, of the United States board of engineers, for internal improvement, was so convinced of the necessity of this knowledge, that when applied to for an estimate of the probable expense of making this very tunnel, he declined giving it, and with the characteristic prudence, for which he is distinguished, writes on the 30th of December, 1824, "An estimate of the

tunnel across the ridge dividing the Little Conemaugh from the Juniata, would require more local information than I am possessed of now." It may be observed, that General Bernard was furnished with a copy of the profile, shewing the line of the tunnel, and the elevation of the heights of the mountain above it, and had viewed the ground, in company with two of my colleagues, in September last.

Though I have no sufficient data, to found an estimate of the expenses of constructing a tunnel of this description, a reference to a few examples, furnished by General Bernard, of the cost of tunnels in other countries, may be of some service.

"*Tunnels in Europe.*

Canal of Great Junction, tunnel of Blisworth, England.

Length,	2,980 yards.
Profile of excavation,	31 yards.

This tunnel cost $71 04 the running yard, or $2 29 the cubic yard.

Note.—The arches are built of brick, the top and bottom arches are thirteen inches thick, the lateral ones 17 inches.

Thames and Medway canal connecting Gravesend with Chatham, England.

Tunnel length,	4,030 yards.
Profile of excavation,	109 60 yards.

This tunnel has cost $ 275 28 the running yard, or $2 51 the cubic yard.

Note.—This tunnel is excavated through compact chalk, nevertheless, it having been found, that in a distance of 1700 yards this bank of chalk was not solid enough to sustain itself without masonry, an arch was thrown over. The bottom of the tunnel is 139 feet on an average below the summit of the mountain it crosses.

Canal of St. Quentin, connecting the Oire and the Somme with the Escaut or Scheld, France.

This canal has two tunnels, that of Riqueval and that of Fronquoi, the first is 6,204 yards long, the second 1,193 yards. The tunnel of Riqueval is the longest now extant in Europe, and is of the following dimensions.

Length,	6,204 yards.
Profile of excavation,	59 78 yards.

This tunnel has cost about $212 the running yard, or about $3 50 the cubic yard.

Note.—This tunnel is excavated through chalk hills of no solidity, which necessitated an arch of 19 inches thickness, and a walling of the same thickness on the whole length. Besides, at several times during its construction, springs of water overflowed the work. The bottom of the tunnel is on an average 270 feet below the summit of the hill crossed by this tunnel.

RECAPITULATION.

The tunnel of Blisworth, has cost per mile,	$125,030 40	
Ditto, of Thames and Medway,	484,492 80	
Ditto, of Riqueval (canal of St. Quentin in France)	373,120 00	about.
Mean cost of these three tunnels per mile,	$327,547 73	

In the month of May last, a tunnel was commenced in England, through Harecastle hill, as appears from the following extract.

Staffordshire, Grand Trunk or Trent and Mersey canal.

"The additional tunnel, through Harecastle hill, was commenced last month. It is calculated to occupy the labor of five years, during which several hundred men must be employed. The expense has been estimated at a guinea an inch, (forward,) the distance being about one mile and three quarters, or 2880 yards, which alone will make 103,680 guineas. The total expense has been calculated at a quarter of a million sterling; shafts will be sunk, &c. steam engines erected for raising the earth, &c. at different points of elevation. The tunnel averaging about seventy yards in depth, from the surface of the hill. The Grand Trunk canal was begun in 1767, and finished in 1777."—*London New Monthly Magazine, for June* 1824.

It appears from the above extract, that the excavation alone of one mile and three quarters, is estimated to cost $484,185 60, that is $ 4 67 an inch, (forward,) exclusive of the expense for shafts, &c. while the necessary preparations and other expenses were estimated at $683,314 40. It may be proper to mention, that the average elevation of this hill is only seventy yards, while that of the Allegheny, where it is proposed to perforate the mountain, is five hundred feet; and the difference in the height of the arch, is also to be taken into the account. It is evident, that the longer the tunnel is, the arch must increase in height in a proportion adequate to the creation of a greater draft of air, so as to keep it pure and prevent mists.

It appears to me, that no just comparison, in matter of estimate, can be formed, between tunnels or canals, without considering the difference of relative situation. In the construction of tunnels, the height of the mountain above the tunnel line, and the number of shafts necessary to be sunk, the nature of the contents and internal impediments, as to springs and cataracts, are all matters of importance, and tend to vary the expense, in proportion as they prevail and abound. In the case of canals, there is evidently a great difference in respect of expense, between those carried along a flat level country, or gentle undulating rises, approaching to a champaign, and those constructed through broken and abrupt transversal ridges, with steep slopes, like those of the Allegheny.

On the contrary, should the works be commenced at both ends, with a view of shunning the expense of sinking shafts, &c. a new dilemma is produced, equally if not more objectionable than the former. According to this plan, the completion of the work, even if the tunnel should be found to answer the purpose, would be protracted to so remote a period, as to disappoint the views of the state, and destroy the hopes of the friends of internal improvement. The proposed scheme admits of the employment of but few hands in this subterraneous work; probably not more than fifteen, if so many, can be engaged at each end at the same time, in the business of excavation. The disadvantages under which labor of this kind must be performed are apparent. It cannot well be supposed that more than one inch (forward) per day, for each man, can be excavated, even though no obstruction should happen from meeting with springs, cataracts or other impediments. As far as experience can be resorted to for instruction, either in Europe or this country, the progress of the work has pregressed with a slow pace, unless where shafts have been sunk to accellerate it, by allowing a proportionate number of miners to labor at the same time, so as to complete the whole within a given or reasonable period. The late Napoleon Bonaparte, while Emperor of the French, in constructing a military road, found it necessary to cut a small tunnel through an abrupt projection of one of the Alpine mountains: thirty one expert men from the corps of miners, were employed in it day and night, and although relieved at every eight hours by fresh hands, it required eighteen months to perforate a distance of two hundred and twenty yards. But we have an example nearer home, more striking and satisfactory than this." "At the Lehigh coal works, they are constructing a tunnel of two hundred yards in length, sixteen feet wide and nine feet high, a double sett of men of twelve, each working day and night, make a foot in length, in the twenty four hours." So writes a correspondent.

As one of the canal commissioners, I respectfully submit the above report. From the imperfect manner in which it has been executed, your Excellency will perceive, that I have not yet recovered from the painful illness under which I have labored since my arrival at this place.

With great consideration and esteem,
I remain, sir,
Your obedient servant.
CHARLES TRCZIYULNY.

To his Excellency John Andrew Shulze,
Governor of Pennsylvania.

No. 165.

Letter from the Auditor General, accompanied with statements of the late and present Brigade Inspectors' accounts.

READ, February 26, 1825.

Auditor General's Office,

February 26th, 1825.

SIR,

Agreeably to a resolution of the House of Representatives, requesting the Auditor General, "to inform this House, whether the several brigade inspectors have in all cases conformed to the forms in issuing their warrants against delinquent militia men, as prescribed by the laws of this commonwealth; and also, if the present and late brigade inspectors have settled up their respective accounts as required by law, and in what cases they have not, with the amount in money, appearing due from each, on the books of his department." I have the honor to transmit the accompanying statements of the accounts of the late and present brigade inspectors, as they appear upon the books in this office.

With great respect,

I am sir, your obedient servant.

DAVID MANN.

To the Honorable Joel B. Sutherland,
Speaker of the House of Representatives.

THE

FIRST ANNUAL REPORT

OF THE

ACTING COMMITTEE

OF

THE SOCIETY

FOR

THE PROMOTION

OF

INTERNAL IMPROVEMENT

IN THE

COMMONWEALTH OF PENNSYLVANIA.

PHILADELPHIA:
PRINTED BY JOSEPH R. A. SKERRETT.
.....
1826.

REPORT.

THE Acting Committee of "The Pennsylvania Society for the promotion of Internal Improvement in the Commonwealth," beg leave to present their first annual report to the Society.

Before entering upon a detail of the proceedings of the committee since their appointment, they ask leave to offer their congratulations upon the favourable dispositions which have been manifested in every part of the state to the cause of internal improvements; upon the progress and extent of sound opinions among our fellow citizens, in relation to those great interests, and upon the measures, which, by the authority of the state legislature, have been in active execution during the past season, to ascertain by surveys and careful explorations, under the supervision of a competent and highly respectable Board of Commissioners, the capacity of the country through which it must pass for a connection between the eastern and western waters; and to determine, by accurate levels, the particular character of every route which has been suggested, as the means of this connection.

The Committee have been assured, that at such a period, in the present session of the legislature as will enable that body to act effectively upon this great object, the Commissioners will make a report, which will contain sufficient and correct materials for legislation in relation to its subject. The feelings, and the wishes, and the interests, of the whole commonwealth, are, with an almost unanimous voice, prepared to sanc-

tion and support such proceedings of our lawgivers, as will authorize the commencement, and assure the completion of this work. The correspondence of the Acting Committee, and other means which they possess to ascertain the state of public opinion upon the question whether Pennsylvania shall have a canal or railroad, to unite the Ohio and the Lake with the Susquehanna and her capital; enable and authorize the Committee to state that "well done, ye good and faithful servants," will be the language of reception their representatives will hear from their constituents, on their return after having enacted such a law.

The Committee acknowledge that in some parts of the state, individuals are yet found who do not unite with the majority of the citizens of Pennsylvania in approving this purpose; and that supposed rival interests, in other sections of the commonwealth, manifest themselves so as to induce an apprehension, that those who are thus influenced, are not the advocates of this great design. But of those who oppose the measure, the numbers diminish daily; and among those whose interests seemed, on a superficial examination, exposed to injury from its success, better views and sounder opinions are forming, and will ultimately have their full effect.

It has become one of the fondest sources of honourable pride among the citizens of Pennsylvania, that her internal improvements, although not always of the most judicious and profitable kind, are more extensive than those of any of her sister states; that they have been spread through almost every part of her vast and fertile country; and that they have been accomplished by the joint and concurrent contributions of her liberal legislatures, and her public-spirited citizens. It is al-

most universally admitted, among her attached citizens, that but one more work is wanted to make Pennsylvania as great a state as any in the confederacy—to unite her people in one indissoluble bond of prosperity and sentiment, to make all *parts* of the commonwealth one flourishing and inseparable *Whole;* and that the means to accomplish these invaluable purposes, are the junction of Lake Erie, the Ohio, the Alleghany, the Susquehanna, and the Delaware, by such cheap and accessible facilities of transport and intercourse, as will enable the productions of all the vast regions of her rich and populous country, upon those waters, to find an Atlantic market, and will allow their owners to receive in return the manufactures and the commercial commodities which they require, and which they will thus become fully competent to purchase.

There is another subject upon which the Committee will also take leave to offer their sincere congratulations to the friends of internal improvement and to the members of the Society. It is that the navigation of every one of the great rivers of the state for steam-boats is now fully and decidedly ascertained to be within the power of the state. By the construction and employment of "the Codorus" upon the Susquehanna, this most important fact has been established; and thus our rivers will be restored to that rank, in the estimation of the citizens of the commonwealth, to which they have always been entitled, but of which a neglect of their capacity for improvement and to be constantly employed, had almost deprived them.

Looking to Europe for science and experience in works of intercommunication, and particularly to England; and deriving from her much valuable knowledge, we have too readily adopted the suggestions of

her engineers, that "rivers should only be used as instruments to accomplish other modes of navigation." But to those enlightened and distinguished men, to Brindley, the father of those principles, *rivers, as they are found in our country, were unknown.* The narrow, yet deep *rivulets* of England, dignified there with the appellation of *rivers,* have no similitude to the broad, and extended, and plentiful waters of Pennsylvania, passing through her territories in different courses more than one thousand miles; breaking through her mountains, and yet preserving so easy and regular a descent towards the ocean, as to make their use in their natural state, at some seasons of the year, perfectly safe and easy, and at other seasons, capable of such improvements as will render them navigable for steam-boats. In our state it therefore never should be said, that the *Alleghany,* the *Susquehanna,* the *Juniata,* and the *Delaware,* were only "*intended*" by the God of Nature "*to feed navigable canals.*"

The rivers of Pennsylvania restored to their proper estimation, improved by legislative bounty and protection, or by the profitable investment of state treasure, will become the surest means by which all the citizens of the commonwealth will be made partakers in the great state work, about, as we confidently trust and believe, to be entered upon. Our rivers being made navigable for steam-boats, the inhabitants of the upper branches of the Delaware and the Susquehanna, of the Alleghany and the Juniata, will participate extensively and equally in all the means of intercourse with other parts of the state, which the completion of that work will certainly furnish. Thus will this great state improvement become a common highway for every citizen of the commonwealth; and its benefits, like the property

the state will hold in it, will be equally divided among us all.

It will be in the recollection of the members of the Society, that the first meeting to form the present association was held upon the 26th of November, 1824. Then it was first resolved to form "a society for the promotion of internal improvement in the commonwealth;" and as soon after that meeting as the *fourteenth of December*, in the same year, the Society was organized, its constitution adopted; and the officers appointed; and by one of the provisions of the constitution, this day, *the first Wednesday in January*, 1826, and annually hereafter, becomes the anniversary of the Society; upon which its officers are to be elected, and its arrangements formed for the promotion of the purposes of the association.

Since its formation, the Society has consisted of forty-eight actual members, and it includes in its list of honorary members, some of the most liberal and active friends of internal improvement in the United States, as well as gentlemen distinguished for science and public spirit in other countries. It is one of the best attributes of the cause in which we are engaged, that it knows no limits from country or from clime; and free from fetters as the great ocean, with which its main object is to establish an easy intercourse, its advocates and its friends are found in every nation; holding in unison the same liberal feelings, and animated by the same desires for the happiness of the whole family of mankind.

The receipts of the society since its formation, have amounted to $ 5540. This sum was the product of the contributions of forty-eight members and of donations by public-spirited citizens and liberal corporations.

As soon as the Society was organized, and its officers appointed, the Acting Committee entered on a vigorous and industrious prosecution of the duties assigned to it, and of the plans which appeared to the Committee best calculated to further the purposes of the Institution, the promotion of internal improvements in the commonwealth.

A circular letter, stating the objects for which the Society had been formed, inviting the co-operation and aid of the citizens of the state for the accomplishment of those objects, and soliciting communications and correspondence, was transmitted to every part of Pennsylvania. It was the earnest wish and expectation of the Acting Committee, that an increase of the influence and capacity of the Society to do good through the commonwealth, would be obtained, by enlisting among its members the many enlightened and public-spirited citizens, who are to be found in every section of our country. The common tie of membership would have produced unity of action and of design; and thus have strengthened and extended the powers of the Society. These efforts have not been attended with the expected results: but the Committee do not yet doubt, that much will be accomplished in this respect by the exertions they have made. The most friendly feelings and most favourable dispositions, are entertained towards the Society in all parts of the state; and although the number of its members has not been augmented, an active, unremitting, and widely beneficial co-operation in all the views of the Society, has been every where manifested.

As early as December, 1824, the Committee prepared and forwarded to Harrisburg, a petition to the legislature, praying for the establishment of a "Board

of Public Works," similar to those of the states of Virginia and North and South Carolina. That this most important object has not been obtained, is by no means an indication of an unfriendly disposition towards it in our legislature. It is not doubted, that when our plans of internal improvement are systematized and selected, and the great work of connecting the eastern and western waters shall be determined upon; the wisdom of our legislature will make so liberal a provision for the establishment of a *Board of Public Works*, as will authorize the executive to confide the important duties of such a board to judicious and competent persons. The selection of eminent citizens as Canal Commissioners, justifies the belief that the board will be properly composed by the appointing constitutional power.

As means of spreading information on internal improvements, and to promote sound opinions in relation to them, the Acting Committee have, since their organization, published and circulated through the state, a variety of papers upon *Turnpike Roads, Canals,* and *Railways.*

As it was the duty of the Committee to abstain from the expression of a preference for any plans of improvement, they have carefully avoided so doing. They have endeavoured to place established facts before the public in an impartial form; and they have invited and encouraged examination and investigation of the merits and advantages of *canals and railways,* and of other modes of communication, by every means in their power. In their efforts to disseminate information, they have had the liberal assistance of many of the journals which are published in the interior, and of most of those of the city of Philadelphia. It would be a denial of justice to the editors of *The United States*

Gazette, were the Committee to withhold a particular notice of the prompt and continued aid in the cause of internal improvement they have received from them.

The Committee were specially instructed, by a resolution of the Society, adopted on the 19th day of January, 1825, to apply for a charter of incorporation, and this injunction was forthwith complied with. A bill to incorporate the Society was reported in both houses of the legislature; but it did not pass into a law in consequence of the pressure of other business, having prior claims upon the consideration of those respectable bodies.

On the 19th of January, 1825, the Society resolved "That it is expedient to send an agent to Europe, to "collect information of all the valuable improvements "in the construction of canals, roads, railways, bridges, "steam-engines, and all other information calculated "to promote the objects of the Society."

This resolution having been referred to the Acting Committee, it immediately received their fullest consideration and attention.

Under an expectation that the government of the United States, then actively engaged in prosecuting inquiries upon subjects connected with the internal improvement of the country, would be disposed to avail itself of the opportunities of obtaining practical information in Europe, which the inquiries of an intelligent and competent agent would afford; and believing that for the accomplishment of so important an object, the Engineer department would, under the authority of the then Chief Magistrate, be willing to contribute to the expenses of such a mission; the Committee addressed a letter to the head of that department, submitting to him the measure, then under the consideration of the Society. It is with regret the Committee

are compelled to state, that this communication did not receive the least notice or attention; and that there was not then manifested in favour of the views and purposes of the Society, that friendly disposition and fostering kindness, which the Committee will have the satisfaction to acknowledge and record in a subsequent part of this report.

Upon the 3d day of February, 1825, the Society appointed William Strickland, Esq. their agent in Europe, assigned to him an adequate compensation, and determined upon the period of his departure.

Upon the Acting Committee devolved the important and responsible duty of preparing the instructions of Mr. Strickland. The judicious selection of a gentleman for this mission, of whose competency every one had the fullest belief, and who enjoyed the confidence and respect of the community, rendered this duty less difficult than it would otherwise have been; and the Committee received from Mr. Strickland every assistance in its performance.

In order to obtain as much information as possible on the subjects upon which the inquiries of the agent of the Society would be most advantageously prosecuted, and to afford to all who should desire to profit by the purpose of the Society, the fullest opportunities to promote their views, "*Heads*" of the subjects for the attention of Mr. Strickland while abroad, were printed, and transmitted to every person, and to every public body who were supposed to be interested therein; and they were earnestly invited to assist the Committee by suggesting any additions to, or alterations in the same. After every effort had been made to invite and collect proper materials, the instructions of Mr. Strickland were prepared and submitted to the Society, and upon the 17th day of March, 1825, they were approv-

ed, and ordered to be signed by the President of the Society, and by the Acting Committee. A copy of these instructions accompany, and are deemed a necessary part of, this report.

At the same meeting of the Society, one hundred pounds sterling were ordered to be placed in the hands of Mr. Strickland "for obtaining correct informa-"tion relative to the smelting of iron," and an equal sum was directed to be employed by him "in the "purchase of memoirs, publications, models and "drawings of useful machines, and authentic infor-"mation on all subjects, a knowledge of which in "this country he might deem important." The Society had, at a previous meeting, resolved to contribute to the expenses of Mr. Samuel Kneass, a young gentleman of considerable talents and promise, the pupil of Mr. Strickland, who was to accompany him in his visit to Europe, and whose assistance was considered by the Society beneficial to the objects of the mission of his instructor.

One of the members of the committee, having taken advantage of the occasion, offered by his being at Washington on the 4th of March last, to communicate to the President of the United States, the intention of the Society to send an agent to Europe, to collect information upon subjects connected with internal improvements; the most friendly dispositions towards their purpose were expressed by the Chief Magistrate; and assurances were received that the agent of the Society would be furnished from the Department of State with letters to the public agents of the government, recommending him and the objects of his mission to their protection and care. An application for these letters was met with the utmost promptitude by the Honourable Henry Clay, the Secretary of State; and Mr.

Strickland was furnished with a general introduction to the public agents of the United States, requesting their kindest offices in his favour.

Mr. Strickland and Mr. Kneass sailed from Philadelphia for Liverpool on the 20th of March, 1825.

The proceedings of Mr. Strickland during his absence, the information communicated by him, and the circumstances of his agency and return, will be hereafter stated.

It will be in the recollection of the members of the Society, that early in the past year, at the suggestion of this Society, a meeting of the citizens of the City and County of Philadelphia was held, at which it was determined to petition the legislature, in favour of constructing a canal at the expense of the state, to connect the Alleghany and Lake Erie with the eastern waters of Pennsylvania. Similar petitions from every part of the state were recommended, in emphatic terms, at that meeting; and a committee of twenty-four, comprised of many of our most respectable citizens of the county and city, was appointed to promote that object, and the great interests of the state, by efforts in favour of internal improvements.

The measures preparatory to that meeting, and the arrangements which were adopted at it, had the support and were assisted by the exertions of the Acting Committee; and as soon as it had been determined by the meeting that the whole state should be invited to petition the legislature in favour of a Grand Pennsylvania Canal, the Committee took upon themselves to further the adoption and execution of that suggestion, by a most active correspondence with every part of the state, and by forwarding printed petitions to many of the known friends of improvement in every county in the commonwealth.

The Committee do not claim, that the universal expression of the wishes of Pennsylvania in favour of measures for internal improvement by the legislature, was the result of their efforts. Proud of their co-operation with the members of the committee of twenty-four in the labours which contributed, and in all probability produced that state of public opinion; they only desire to report to the Society their performance of the duties entrusted to them.

A public-spirited citizen, while a member of the Committee of twenty-four, proposed that a *Convention on Internal Improvement* should be held, and that delegates from every part of the state should be invited to attend the same at Harrisburg. This proposition was highly satisfactory to the Committee, and a disposition to promote the measure, and procure its adoption throughout the commonwealth, was immediately avowed in their correspondence and publications. The Society, at a meeting held upon the 6th of April, approved of the calling a convention on internal improvement, and the Acting Committee were specially instructed, to aid the Committee of twenty-four in promoting the measure.

After the Committee of twenty-four had determined to recommend a convention, the Acting Committe entered upon the most extensive means to secure the success of the proposition. An address to the citizens of the state, prepared by one of the members of the Committee, was circulated, and letters soliciting the active assistance and co-operation of every advocate and supporter of internal improvement, were addressed to the post-masters, and to every distinguished individual whose name was in possession of the Committee.

Explicitly disavowing all claims to the original me-

rits of the proposition, the Committee freely became the agents to further its adoption, and it is a sufficient reward of their exertions that the end was accomplished.

The convention of Harrisburg, and its proceedings, will form a bright page in the history of Pennsylvania. That assembly was composed of gentlemen of the most distinguished talents and of the most honourable purposes. Uninfluenced by local feelings; unmindful of all local interests; the good, the prosperity, and the happiness of the whole commonwealth was their sole end and purpose; and with a wisdom and foresight, which will at a future day enroll the members of the convention among the founders of the wealth and power and greatness of Pennsylvania, they

"*Resolved*, That the improvement of the Commonwealth will "be best promoted, and the foundations of her prosperity and "happiness most securely established, by opening an entire and "complete communication from the Susquehanna to the Alleg- "hany and Ohio, and from the Alleghany to Lake Erie, by the "nearest and best practicable route; and that such a work is in- "dispensably necessary to maintain the character and standing of "the state, and to preserve her strength and resources."

In favour of the internal improvement of the state, the sentiments of the members of the convention were unanimous. A very small minority differed with the majority, as to the manner and the time for the commencement and attainment of this object; for the ultimate promotion of which they declared and recorded by their votes, their most decided and friendly wishes. The legislature of Pennsylvania have, in the proceedings of that convention, the fullest evidence of the desire of the whole commonwealth, for the immediate adoption of effective measures to execute the purposes which that convention has declared, will best

promote her interest, and the attainment of which has been avowed to be within her power and her means.

Early in the past year, the subject of a geological survey of the state of Pennsylvania, was submitted to the consideration of the Society by the Acting Committee. Its high importance, its intimate connection with the cause and interests of internal improvement, its certain development of the rich mineral treasures of our state, and its boundless contribution to the wealth and prosperity of the commonwealth, were at once seen by the Society, and the proposition obtained the full approbation of the members.

In order to carry the design into the most advantageous execution, the Committee deemed it proper to communicate their views to the Academy of Natural Sciences of the city of Philadelphia. That institution, composed of gentlemen justly distinguished for their attainments in the natural sciences, and peculiarly competent to digest and arrange the proper plans for carrying such a survey into execution, as well as to select the agents who should be entrusted with it; was invited to co-operate with the Committee in the measure. The most friendly dispositions, and an ample tender of their assistance, were promptly received from the Academy, and the Acting Committee have authority to assure the Society, that every reliance may be placed on the Academy; for all aid we ought to ask from them for the accomplishment of the proposed survey, when we shall determine to undertake the same.

But the Acting Committee were restrained from entering upon definitive measures to obtain such a survey by the diminished state of the funds of the Society; and although they are satisfied that no undertaking would be more important, none more productive of

rich rewards to the state and nation, the execution of the plan must be suspended until pecuniary means shall be obtained to defray the expenses which will attend it. The completion of a survey, which would comprehend a minute and careful examination of every section of the state, and a chemical analysis of all our minerals, the whole to be executed by gentlemen of entire fitness for the trust, would not exceed in cost the sum of *three thousand dollars*. If the importance and value of the object were sufficiently known and understood at the seat of government, it is not doubted that the legislature would promote its attainment by a liberal donation.

The Committee now enter upon the most pleasing of their duties, in recording the proceedings of the agent of the Society, during his absence in Europe on the trust assigned him. A liberal and enlightened citizen has recently declared this mission to be "a more important embassy, than any we, (the nation,) support in Europe." The Society and our country, we believe, will, at no distant day, find this high commendation justified by the benefits the community will derive from the efficient labours of Mr. Strickland.

Immediately upon his landing, Mr. Strickland entered upon the duties with which he was charged; and during the whole period of his absence, his diligence and industry, and untired activity, were exclusively dedicated to the collection of the information, and the accomplishment of the objects, to which he was pledged.

It is a just tribute, and one which is rendered with peculiar satisfaction to those who are so well entitled to it, to state to the Society, that from every gentleman of science and attainments in those branches of knowledge and the arts which are particularly connected with civil

engineering, Mr. Strickland received the most liberal and extensive assistance. The bureaus of the British engineers of the first rank and acknowledged usefulness, the cabinets of men of science in England, Ireland, and Scotland, were freely thrown open to him; and all they had acquired by diligent study and experiment, all they had done in the erection of the great works which are the just and merited pride of those countries, and the principal sources of their wealth and prosperity, were placed at his disposal. Science and philosophy, and the liberal arts, are usually found in the possession of men of enlarged and expanded views and of the most generous purposes. It is one of the best effects of knowledge and intelligence, that they liberalize the heart, and unshackle it from the influence and power of prejudice, and from the bonds of local interests. The best and the most pleasing testimony of the truth of these principles, has been exhibited by the conduct of the engineers of England, Scotland, and Ireland, to Mr. Strickland.

The first subjects to which the Agent of the Society was directed to give his attention, was the construction, and use, and expense of *railways*. As means of extensive intercommunication, railways were at the time of the departure of Mr. Strickland unknown in the United States; and at the period of his arrival in England their advocates were actively engaged in recommending their adoption, for general transportation, in preference to canals, to which they were said to be superior. The opportunities for examination and inquiry in relation to them were therefore all that he could desire; and of these Mr. Strickland immediately availed himself to procure accurate information upon all and every matter connected with the making, the employment, and the cost of rail-

ways. In the prosecution of these investigations, and to test by actual examination and observation, the principles and statements of the friends and of the opponents of railways, Mr. Strickland visited England, Scotland, and Wales; and in August the Society received his report, dated June 5, 1825, containing the information he had collected, accompanied with plans and drawings of railways, of almost every form then in use or in contemplation in England and Scotland. It is not permitted to the Committee, to enter into a minute exhibition of the contents of this, or of any of the reports of the agent of the Society. Those reports have been minutely examined by many of the members, and they have been freely communicated to every individual who desired to inspect them. The Committee, however, will assume to state, that, so comprehensive, so particular, and so full is the report of Mr. Strickland upon the construction, use, and expense of railways, and of the machinery employed upon them, that all which may be required for their introduction in our country, or to manifest and establish their competency for the purpose to which they are applicable, will be found in his report. By the acquisition of this knowledge of railways, which has been the consequence of the mission of Mr. Strickland, it is now as much in the power of our state, or of any individual or corporation, to erect and adopt a railway of the best or of any form of construction, as it would be were *Wood*, and *Jessup*, and *Rennie*, and *Telford*, and *Tredgold*, to become resident citizens of the commonwealth of Pennsylvania. A working model of a locomotive engine, on the most approved plan, and having a power equal to the strength of two men, was procured by Mr. Strickland, and is in the possession of

the Society. A machine so valuable, and of such astonishing competency for the purposes to which it may be applied, ought to be more generally known in our country.

The next report received from Mr. Strickland was dated the 16th of June, 1825, which, as far as its contents are connected with *railways*, may be considered as *a supplement* to the *first report*. It contains *"a description of the Duke of Portland's tram-road,"* and a very particular and interesting account of the mode of *coking bituminous coal*, and of *making cast and blister steel*. The drawings which accompany and form a part of this report, exhibit, in detail, the processes which are in successful use in England for the production and manufacture of the articles mentioned. To those sections of our country where bituminous coal abounds, and where no method of coking it for the purposes of *smelting iron* has yet been in successful operation, the *plans of the ovens*, by which this process is accomplished, may be essentially important; and the information communicated upon this *grand desideratum* in the making of iron in *Western Pennsylvania*, may be employed to remove the difficulties, which have hitherto baffled all the efforts of those who have endeavoured to use that coal in their smelting furnaces.

In order to assist, and fully to explain the method employed in making *cast* and *blister steel*, this report contains plans and sections of the furnaces and instruments, used in the conversion of iron into those valuable articles. It will be for those whose pursuits and interests will induce them to examine these details, and who may wish to profit by them, to appreciate the advantages to be derived from the matter contained in

this valuable treatise upon the making of cast and blister steel, and its accompanying drawings.

The report of the agent upon *Turnpike-roads*, is dated August 3, 1825. The matter contained in this report is of the most interesting kind, and it furnishes facts and suggestions for their advantageous use in the construction of roads, which, if employed, will be of the most extended usefulness.

The whole method of Mr. M'Adam for improving roads, and the principles so successfully applied to them, are fully shown in this report. The plan upon which "the great government road from Hollyhead to London," is made, which Mr. Strickland pronounces "one of the smoothest and best in England," is particularly described in it. This road is the work of *Mr. Telford.*

On the 4th of September, from London Mr. Strickland transmitted to the Society his "*Report upon the manufacture of Iron, Oil and Coal Gas.*"

The materials of which this report is composed are interesting, and will no doubt be found highly useful. The manufacture of iron is, however, a subject not to be comprehended in the space of *one* report; nor will the Society find in this communication all the information upon this most important subject, the agency in England has secured for our country. Under the authority of the resolution of the Society, which gave him the privilege of appropriating one hundred pounds sterling, to inquiries upon the manufacture of iron, it is understood by the Committee, that a gentleman entirely fitted for the trust, is now engaged in preparing a report, which will contain full and perspicuous working details of the numerous processes in smelting and preparing iron: of the various and successful methods

by which iron ores of different kinds are brought into profitable and uninterrupted use, and of the effectual and certain means of preparing bituminous coal, for its general employment in the manufacture of iron.

But notwithstanding the acknowledged impossibility of comprehending all these useful matters in his report, Mr. Strickland has furnished, in reference to the manufacture of iron, much valuable information; and his plans and elevations of the most approved furnaces for the smelting of iron, ought to obtain the attention of the iron masters of our state.

Upon *Oil* and *Coal Gas*, useful knowledge is communicated; and the introduction of gas into our city, or its employment for lighting extensive manufactories, may be secured by the use of the materials exhibited in this report.

The last information, in the form of a report, which was received from Mr. Strickland, is dated at London on the 4th September, 1825. This report is "*Upon Canals.*"

It would require the talents and attainments of a civil engineer, to develope and exhibit as they deserve the contents of this communication. These are beyond the ability of the Acting Committee; but they will claim permission to state, that upon all the most important subjects connected with the construction of a canal, upon the most approved methods of forming and using locks and embankments, upon the best modes of building aqueducts and culverts, and of forming tunnels, and upon the most valuable and successful arts of securing such works from accidents and injury; the information contained in this report of the agent of the Society, appears abundant and all-sufficient. With this, as with all of his communications, are transmitted

drafts and plans, and sections, and drawings of all the parts, and details of the works of which the report treats. These, like the working models of a skilful architect, will enable any one properly prepared by study and experience in the science of civil engineering, to apply the information communicated in the report to immediate use and advantage.

After the report upon canals was completed, Mr. Strickland was assiduously engaged in prosecuting inquiries upon other subjects which had been given him in charge in his instructions. The information collected by him in relation to these and other important matters, has not yet been embodied in a form to be communicated to the Society. Having, as he believed, accomplished the objects of his appointment, and desirous of returning home at a period when the knowledge he had attained might be employed for the promotion of the great purposes of the Society, he left England, and arrived in Philadelphia in December.

Since the return of Mr. Strickland, a letter has been received from him, dated at Liverpool on the 20th day of October, written in reply to a letter addressed to him by the Acting Committee, under date of September 17th. The letter contains some important views of the use and employment of railways in Pennsylvania. These, together with extracts from the correspondence of the Acting Committee, have been published, and they accompany this report.

Mr. Strickland is now engaged in a final report to the Society, in which he will no doubt communicate much important information, upon all the subjects which had his attention when absent. The Society have a right to expect much from him, upon those matters of which he has not yet treated in the reports received

from him. His obligations thus to complete his duties to the Society are acknowledged by him; but he may not be able fully to comply with his own and their wishes for some time, in consequence of engagements of the utmost importance to the interests of the state. The Society will not refuse their consent to this postponement, as it is produced by Mr. Strickland's being now employed, under the Canal Commissioners, to assist in arranging the materials of their intended report to the legislature.

A most important and interesting question is necessarily presented for the consideration of the Society in consequence of their possession of the information contained in the reports of Mr. Strickland, and the obligation which arises therefrom to communicate them to the public. Their publication is essential to their extended usefulness; and yet the expense of printing the reports and engraving the plans and drawings, which form important parts of them, and without which they cannot be perfectly understood, will require an expenditure beyond the present means of the Society. Whether legislative and private aid for the purpose of making these reports public will be given, is not yet known. It would not become the Society to solicit such aid, although if it were voluntarily tendered, it should not be refused.

Subjoined to this communication is an accurate list of the publications and manuscripts, received from Mr. Strickland during his absence.

Before the Committee bring this report to a conclusion, they ask leave to submit some considerations upon the present situation of the Society, and to suggest, respectfully, the means of increasing the number of its members, and thus augmenting its capacity for

usefulness, and to promote the design for which its members associated.

The funds of the Society will, from the report of the Treasurer, be found to be greatly reduced. Indeed its only certain additional pecuniary means, during the present year, must be derived from the annual contributions of its present members. The whole number of members of the Society is now forty-four, and the revenue of the Society, under its present constitution, will therefore, during the year, be but four hundred and forty dollars. This sum is altogether inadequate to accomplish any of those purposes, which ought to command the attention of those who so anxiously desire to promote the great cause of internal improvement. It will be sufficient for the common objects of the association, but the great and valuable purpose of a geological survey of the state must be abandoned. Restricted to a narrow sphere of action, the Society will cease to be considered, as it now is, a great and powerful engine, to move the whole commonwealth forward in the cause of internal improvement, and to promote that object by a liberal and beneficial appropriation of pecuniary means, wherever they can be properly employed.

The Committee respectfully submit to the Society, that as one of the great objects for which large contributions required from the members on their first associating has been fully accomplished; as an agent has been employed in Europe, has been supported there at the expense of the Society, has been thus enabled to collect information of the highest value and importance, and has returned to the state; the continued demand of so large a sum on admission to the Society, seems no longer politic, just, or proper.

A new era now commences; one in which the So-

ciety should desire to employ and disseminate the information it has obtained, and in which its influence and usefulness should be increased by large additions to the members of which it is composed.

It must be allowed that the demand of one hundred dollars upon admission, was only justified by the necessity of the occasion, and was vindicated by the absolute and immediate want of a sufficient fund to send and support an agent abroad. That this regulation excluded many gentlemen of the first qualifications, and of the best dispositions towards the cause in which the Society was engaged, was known to and painfully acknowledged by us all. However liberal and well disposed those gentlemen were, they may have properly refused to bestow so large a sum on an object, in the attainment of which every citizen of the state had an equal interest, and to which all ought therefore to have contributed.

Nor should it be charged to any other than these fair and just views of the subject, that the Society did not at an early period, enroll among its members many of our citizens, who have been found prompt and ready on many occasions, to dedicate no inconsiderable portion of their fortunes, to public, and charitable, and liberal, and patriotic purposes.

Others were prevented, by proper considerations, from abstracting so large a sum from their current means; although their willingness to unite in the views of the Society were fully manifested, and their dispositions to become members of an association for the same objects, and upon a scheme less costly, were openly declared.

It is therefore inquired by the Committee, why a new organization of the Society shall not now be made, by

which numbers of our fellow citizens, both in the capital and in the country, will be induced to become its members, and by a limited annual payment, enable the Society to go on successfully in its march of usefulness, and in the accomplishment of its objects.

The present Society has not been incorporated. No obstacle therefore exists to the execution of the plan which the Committee now submit, and which, if approved by the Society, may be confided to a Committee to report thereon at a future stated meeting.

MATHEW CAREY,
RICHARD PETERS, Jun.
WILLIAM LEHMAN,
JOSEPH HEMPHILL,
STEPHEN DUNCAN.

GERARD RALSTON, *Corresponding Secretary.*

Philadelphia, Jan. 4, 1826.

LIST

OF

BOOKS, MANUSCRIPTS, AND OTHER ARTICLES,

BELONGING TO

THE PENNSYLVANIA SOCIETY FOR THE PROMOTION OF INTERNAL IMPROVEMENT.

Railways compared with Canals and Common Roads, copied from the Scotchman Newspaper. Edinburg. Pamphlet, 66 pages, 1825.

The Fingerpost, &c. being a discussion of the Railway Question, by ???. London. Pamphlet, 48 pages, 1825.

Manuscript Report on Railways by William Strickland. Edinburg, June 5, 1825.

Manuscript Report on the Duke of Portland's Tram-Road, and on the manufacture of Coke, Blister and Cast Steel, by William Strickland. Glasgow, June 16, 1825.

Manuscript Report on Turnpike Roads, by William Strickland. Bristol, August 3, 1825.

Manuscript Report on the manufacture of Iron, Oil and Coal Gas, &c. by William Strickland. London, Sept. 4, 1825.

Reports on Civil Engineering, by John Smeaton, 3 vols, 4to. London, 1812.

Miscellaneous Papers, with 12 plates, by J. Smeaton, 1 vol. 4to. London, 1814.

Theory and Practice of Gas Lighting, by T. S. Peckson, 1 vol. 8vo. 2d edition. London, 1823.

Practical Essays on Mill Work, &c. by Robertson Buchanan, with notes by Tredgold, 2nd edition. London, 1823, 2 vols. 8vo.

Theory and Practice of Warming and Ventilating Houses, by an Engineer. London, 1825, 1 vol. 8vo.

Practical Essay on the Strength of Cast Iron, &c. by Thomas Tredgold. London, 1824, 1 vol. 8vo.

Principles of Warming and Ventilating Houses, by Thomas Tredgold. London, 1824, 1 vol. 8vo.

Practical Treatise on Rail Roads and Carriages, by Thomas Tredgold, London, 1825, 1 vol. 8vo.

Observations on the Rebuilding of London Bridge, by John Seaward. London, 1824, 1 vol. 8vo.

Traité Théorique et Pratique, de l'Art de Batir, par J. Rondelet, 6 vols. 4to. and 1 vol. of plates. Paris, 1812.

Observations on a General Iron Railway, by Thomas Gray, 5th edition, 1 vol. 8vo. London, 1825.

General Rules for Repairing Roads, by the Parliamentary Commissioners, 1 vol. 8vo. London, 1823, 4th edition.

Description of the Iron Bridges of Suspension, at Bangor, Conway, &c. by T. G. Cumming. London, 1824, 1 vol. 8vo. Pamphlet, 55 pages.

Register of Arts and Sciences, 2 vols. 8vo. London, 1824 and 5.

Scientific Gazette, 7 first numbers, commencing July 2, 1825, ending August 13, 1825.

Register of Arts and Sciences, two numbers, July 30th and Aug. 12, 1825.

Eleventh Report of the Commissioners for repair of Roads and Bridges in Scotland, folio, 21 pages, March 25, 1825.

Report of the Berwick and Morpeth Road, folio, 8 pages with a map. May 5, 1825.

First Report on the Road from London to Holyhead, May 13, 1824. Folio, 39 pages.

Second Report on the Road from London to Holyhead. Folio, 16 pages. June 27, 1825.

Report on the Shrewsbury and Holyhead Road. March 25, 1825. Folio, 11 pages.

Estimates for the Holyhead and Howth Roads, March 25th, 1825. Folio, 3 pages.

Twenty-second Caledonian Canal Report, May 27, 1825. Folio, 27 pages.

, Bridges, 13 plates. Royal sheet.

Manuscript Report on Canals, by William Strickland. London, Sept. 14, 1825.

View of Hetton Railway with Locomotive and Stationary Engines.

Report on the Shrewsbury and Holyhead Road, March 22d, 1825. Folio, 10 pages.

Manuscript Report on the manufacture of Roman Cement, accompanied by several specimens of the material from which it is made, by J. J. Hawkins. London, October 31, 1825.

Letter to Mr. Strickland from J. J. Hawkins. London, October 31, 1825.

Estimate and Prices for the Masonry of George's Dock. Liverpool.

Liverpool Dock Accounts, Liverpool, June 24, 1825.

Rapport et Memoire sur les Ponts suspendus, 4to. Paris, 1823.

Plates accompanying the above.

Box of Minerals, containing Iron-ore, Fire-brick clay, specimens of Coke of the bituminous coal, &c. &c.

Duplicate Manuscript Report of William Strickland on Canals, &c.

Duplicate Manuscript Report of William Strickland on Railways, Coke, manufacture of Iron, Blister and Cast Steel, Oil and Coal Gas, &c. &c. with numerous drawings.

(COPY.)

MR. STRICKLAND'S INSTRUCTIONS.

Philadelphia, March 18, 1825.

William Strickland, Esq.

Dear Sir.—The Acting Committee of "The Pennsylvania Society for the Promotion of Internal Improvement," beg leave to call your attention to the general outlines of the duties you will have to perform, as the agent of the Society in Europe.

The objects for the attainment of which the Society have determined upon this measure, the execution of which is delegated to you, are known to you, and you will constantly have in view their accomplishment with your best abilities. The confidence we place in your talents and industry, the obligations you will be under to obtain, for the heavy expenses attendant on your agency, an adequate return; and the satisfaction, as well as the rewards you will yourself have in contributing, by the success of your labours to the prosperity, wealth, and happiness of your native state and of your country; are ample pledges of the fidelity and diligence with which you will execute the duties of the important trust.

You will proceed from this city to Liverpool, taking your passage in one of the line of packets from this port, and commencing your voyage within the present month.

As *England*, *Scotland*, *Wales*, and *Ireland*, have made more progress in the arts and sciences, and have more extensively and successfully applied them to internal improvements, your observations, inquiries and investigations will, in the first portion of the time you will be absent, be directed to the great works which have been accomplished in those countries. You will afterwards proceed to *France*, *Holland* and *Germany*, should any objects of sufficient interest exist there, and time shall permit the same. Thus we desire it to be distinctly understood, that you will visit no other parts of Europe, unless further instructed, than England, Scotland, Wales, Ireland, France, Holland, and Germany.

As a general principle which shall govern you in all your proceedings, and as the leading purpose in all your pursuits, we wish you to understand, distinctly, that all the knowledge and information you can collect, all the facts which you shall become possessed of, which may in any manner be connected with your mission, must be carefully, accurately, and minutely written down and preserved in the form of a diary, or such other record as will enable you to communicate the same to the Society, in memoirs or reports, when your duties shall enjoin the same. All the results of your inquiries and exertions will be the property of the Society.

Another and equally important rule which we wish you to observe and faithfully execute, is the following.

It is not a knowledge of abstract principles, nor an indefinite and general account of their application to the great works of Europe, we desire to possess through your labours. These we have in books, and your mission would be of little comparative value, should you acquire for the Society such information only. What we earnestly wish to obtain, is the means of executing all those works in the best manner, and with the greatest economy and certainty; and for these purposes you will procure and exhibit in your reports, all that will enable those who shall undertake the formation of *Canals*, *Railways*, and *Roads*, and the construction of *Bridges*, to perform the work, without such persons having the science by which such works were originally planned and executed. To use a term which is familiar to you as an architect, we desire to obtain *working plans* of the best constructed canals, and their locks and inclined planes; of railways, and all the means of using them to advantage; of *roads*, and of the mode of their formation and preservation; and of the construction of *bridges*. To be more definite on this head, we desire that you furnish such minute and particular descriptions, plans, drawings, sections, estimates and directions, as possessed of them, those works may be executed in Pennsylvania, without the superintendence of a civil engineer of superior skill and science.

Before we proceed to a particular statement of the subjects for your investigations on your mission, we would claim your attention to a pledge which has been given by the Society to the public; that your first efforts shall be directed to *railways*, and that at as early a period as possible you shall communicate all the information you can collect upon them.

Canals. In your examination of the canals of Europe, we request you will always bear in mind the fact that the great capital which is ever at the command of those who there undertake such works, and the immediate and profitable use to which they can be applied; have induced those who have executed them, to regard their cost of less importance than we are compelled to consider it here. When a work of that kind will produce returns of three or four times the rate of interest in the country where it is executed, expenditure is of less consequence than with us, where the pecuniary means to accomplish any such purposes are collected with great difficulty, and where attempts to execute them frequently fail from a want of capital. Whatever may be the certainty of ultimate profit from any of our canals or roads, we have always found obstacles to obtaining funds for their prompt execution. In the differences between the cost of labour in England and Scotland, and in America, the cheapness of some of the materials used in the construction of their public works, and in the facilities of transporting those materials which the improved state of the country, and the existence of canals and railways in the vici-

nity afford; may be found many important facts which have materially influenced the cost of those works; on the other hand we have materials, which may not have been used there on account of their scarcity and expense, and which if substituted in our undertakings, would materially diminish our expenditures in the formation of canals with their locks, and inclined planes. Thus *wood* is in England a most costly article, and hence stone is there generally substituted. If wood could be used in the construction of the *locks* of canals, more than two-thirds of their expense would be saved, and the execution of many works of this description in our country would be certain.

With these introductory remarks, which are submitted to your candid consideration, we proceed to say, that you will in reference to *canals* inquire and report to the Society upon, 1st. The most approved and substantial method of constructing *Lock Gates* together with their *valves* and sluices.

2d. The best mode of lining and *puddling Aqueducts and Culverts.*

3d. The best plan for overcoming the difficulty in forming the bottom and side banks of a canal through lime stone formations; or formations which are cavernous, porous or soluble in water; particularly in deep cutting and in embanking.

4th. The cost of the work by the cubic yard, stating the particular quality and parts thereof.

5th. The failures in canals; their causes; and other circumstances connected therewith.

6th. Rock excavation; tunnelling generally, and through *gravel and other loose soil;* the use and frequency of *shafts;* together with the best method of removing the materials, and draining the work in its progress: the greatest depth of shafts, and how preserved and constructed?

7th. The quantum of *evaporation* and *soakage*, particularly considered, reference being made to the *locations*, *soil* and *quality* of the work.

We also request your attention to the following queries, which relate to canals or subjects connected with their use.

8th. Is there any substitute for locks, now in use in England, or on the continent? If so, what advantages have they been found to possess?

9th. Is there any information in England concerning the evaporation of water occasioned in canals by variations of climate? The great mining districts of Germany, furnish some very curious results as to the evaporation by high winds in the autumn and winter season.

Perhaps the canals of the south of France may afford some facts on the solar evaporation, in summer. Our climate is so different from that of England, that we must endeavour to obtain *data* on this subject from the continent.

10th. Are steam boats permitted to navigate any of the canals

in Great Britain. If any, what means have been devised to prevent the destruction of the banks, produced by the motion imparted to the water?

11th. Are any of the tunnels in England made through crumbling rocks? if so, what arch is preferred for their protection? is there any case where a complete elipsis has been required, as in mines?

12th. If a rock is not to be obtained for a foundation for the lock walls, do they in every instance pile or construct inverted arches, upon which to build their walls; or do they, when they have good gravel or slate, rely upon it for a foundation? If not, may not timber laid lengthways be relied on? When they have not rock for the bottom of their locks, do they make an artificial bottom of stone or wood?

13th. Do they build their lock walls in straight or curvilinear lines? What is the thickness of their lock walls, and are they supported by buttresses extending into the banks? or by giving the walls a greater thickness, do they supersede the necessity for buttresses? How are their lock walls built—if of cut stone in front, how is the backing constructed—whether of common rough mason work, or of large stone well fitted together? What is the best kind of cement, and how is it affected by the seasons? How soon does it perish?

14th. What is the slope of the banks of a canal? What the height of the banks above the surface of the water, particularly the towing path side, and its width?

15th. In very deep shafts, are the workmen affected by the gases from the bowels of the earth? Is there an instance of the workmen being driven off by the gases? What proportion does the diameter of the shafts bear to their depth? What distance are shafts apart, and is not this regulated by the depth of digging or height of the hill? What is the greatest depth a shaft may be sunk?

16th. What kind of river navigation have they above the tide? How is the navigation constructed? What kind of towing paths have they? What distance are they from the boat channel, and when the distance between them is very great, is the power for propelling the boat necessarily very much increased? If so, is it in direct proportion to the distance?

17th. What kind of gates have they across the towing paths, where they pass through different enclosures?

18th. In the severe weather in the winter, do they draw the water off their canals?

19th. Have the frosts of winter, any pernicious effect upon their canals, locks, turnpikes and rail-roads?

20th. What descent have their canals, or what is the approved descent? What is the greatest acclivity of rail-roads?

Mr. John Blair of our state, whose communications to the Society have always been valuable, has expressed a wish that you should

inquire, whether wooden locks are in use, what length of time they will last, and what is the comparative expense between them and stone locks? He remarks, and justly, that as our western canals must have the greatest portion of their lockage in, and near the mountains, where there are inexhaustible forests of timber; should timber be useful, and the durability of such locks considerable, a great saving would be effected. This subject is placed in a very interesting position by a letter of Mr. Sellers, which we request you will peruse. Like the early settlements of our country, we may find it advantageous to be simple and homely in our first works, and in time, replace them by others of a superior execution and of permanent materials.

Railways.—Of the utility of railways and their importance as means of transporting *large burdens*, we have full knowledge. Of the *mode* of constructing them and of their cost nothing is known with certainty. Even in England, where *railways* have been used for more than a century, these are subjects of controversy and doubt. You will arrive at Liverpool at a peculiarly fortunate era in the construction and employment of railways. The great communication by their means between Manchester and Liverpool, and between Birmingham and Liverpool, will have been commenced, or all the principles and plans, by which they will be governed in their construction, will have been settled and determined.

We desire that your inquiries in relation to *railways* shall be commenced and prosecuted as soon as you arrive, and that as speedily as you shall have obtained all the information upon them you deem important and sufficient, that you transmit the same to us, retaining a duplicate of your report, and of the drawings and estimates which may accompany it for illustration.

You will bear in mind, in your investigations of this subject, that we have, as yet, no complete railway in Pennsylvania; and you will therefore so exhibit your facts, so that they may be understood by reference to the drawings which you may make, and which shall accompany your report.

Commencing in your examinations with the plans observed in making surveys and forming the line of the route of the railway; it is desired that you ascertain with precision the greatest angles of ascent which the profitable use of railways will bear. In our mountainous state, if railways shall be adopted, they must pass over numerous elevations, some of them abrupt, and many of them so formed as to render their reduction impossible.

The *foundations* for the reception of the iron rail will next require attention. Climate must enter materially into the decision upon the question how the foundation of a railway shall be made in Pennsylvania; and the differences between the moist and moderate winters of England, and the deep snows, sudden and hard frosts, variable temperature, and long continuance of our winters; must have your consideration and attention in these examinations.

Without entering into the subject particularly, but submitting it, with great deference, to your consideration, we would remark, that if masonry could be avoided in the construction of the foundation for the iron rails, if wood, however large in size, and great in quantity can be employed here, the influence of our climate upon the work would be less injurious. Durability of the materials would be lost by the use of wood, but the parts might retain their form and connection for a long time, and the small expense of replacing any part of the work, which might decay, would perhaps compensate for the absence of permanent substances in the foundation. In relation to the construction and form of the road and rails, we desire you to ascertain every mode which is now in favourable use in England, Scotland, and Wales. It is said that recent improvements have been made in the form and position of the rails, and that different forms are used for different purposes. How railways are crossed by wagons heavily laden, how wagons pass when proceeding in opposite directions, what means are taken for the protection of railways from injury by wheels not properly constructed to pass upon them, and how the wagons and their carriages are constructed, and of what materials? Upon all these subjects we ask particular information, accompanied with drawings which will make the same easily understood and employed.

The *expense* of railways will be a subject of careful and particular investigation. In your statements under this head you will inform us of the separate cost of each part, distinguishing accurately between the charges for the formation of the line, and the preparation of the foundation, and the expense of the materials employed. The difference between the cost of labour in England and in this country will affect these statements; and it would, therefore, be well if you would accompany your report with information of the rates of day labour, in the particular parts of the country where the railways are located, which may be referred to by you.

Locomotive machinery will command your attention and inquiry. This is entirely unknown in the United States, and we authorize you to procure a model of the most approved locomotive machine, at the expense of the Society.

Turnpikes.—On the subject of the improved mode of constructing roads by Mr. M'Adam, we have, as you know, all that have been published. These publications, however, give us rather the evidence of the excellence of the roads made upon that plan, than a practical and familiar description of the *manner* in which they are executed. A report descriptive of the first preparation and arrangement of the ground over which the road is to pass, and which is to become the foundation of the stone work; the following steps preparatory to the covering of this with stone; the nature of the stone to be used; its preparation and the manner in which it is applied; the measures adopted to prevent injury to the road while in the course of construction; the final completion of

the road and the mode of keeping it in order, with the regulations as to its use, particularly the description of carriages or wagons used upon it. All these will command and obtain your careful attention. Should you think the suggestion worthy of your consideration and adoption, we would propose that you should prepare or obtain a memoir on this subject, directory of the course of proceeding to construct a M'Adam's road, so particular, so full, so descriptive, so plain, and accompanied with such illustrations by drawings, as will enable any good road maker to commence and execute the work.

A person who is perfectly acquainted with M'Adam's principles of road making, who has been accustomed to apply them in the construction of roads, and who should bring with him testimonials of character and practical skill, would find employment in the United States. The Society will not give a pledge to compensate such an individual for visiting the United States, but you are authorized to assure him that all the patronage and efforts of the individual members of the association can do to promote the fortunes of such a man will be exerted.

Gas Lights. The proposed introduction of gas into the City of Philadelphia, makes it important that at as early a moment as your other duties will permit, you furnish a full report upon this subject. What is the best and most economical apparatus? What material is preferred, and the reasons for the preference, the cost of the material in England, the most approved plan for conducting gas from the place of manufacture to where it is used, the employment of detached and transportable gasometers or fountains, and their cost, and their mode of use, and how all the machinery which may be required for the construction of the works and for the distribution of gas in Philadelphia can be obtained, and at what costs? These are submitted as heads of inquiry.

Break Waters. The intimate connexion between the commercial prosperity of our state and its internal improvement, and the important advantages which would be consequent on the erection of a Breakwater at the mouth of the Bay of Delaware, have induced the Society to ask you to procure information, of the most approved plan, for constructing a floating Breakwater. A floating Breakwater is said to have withstood the destructive storm which lately shook, to its foundations, that which was built of stone at Plymouth; and as the cost of the former is said to be much less than that of the latter, it is desired to obtain a full knowledge of the plan and construction of the same; how anchored and sunk, its capacity to resist the ocean, and the effect of the same upon it; its cost and its competency compared with works of a similar kind, which are built of stone and are intended to be immoveable?

Manufacture of Iron.—We approach this subject with the deepest impression of its importance, and with a firm conviction that the full investigation of it will require more time than you can bestow upon it. We are satisfied that it would yield golden returns,

if an agent of competent talents and information, should be exclusively employed in the investigations and inquiries connected with the manufacture of iron in England and Wales. If the wealth of England has been correctly ascribed to her iron and her coal, Pennsylvania may with equal certainty become the England of the New World, in these riches; for she has coal of a quality superior to that of her most prosperous rival, and she has great varieties of this most valuable mineral; and she has iron ores of every description and kind which are known in any part of the world. No improvements have been made here in it within the last thirty years, and the use of bituminous and anthracite coal in our furnaces is absolutely and entirely unknown. It is said that since the use of mineral coal in the making of iron was introduced, England has increased the manufacture of this article many thousand fold; and the cost of its production has been diminished one-half.

Attempts, and of the most costly kind, have been made to use the coal of the western part of our state in the production of iron. Furnaces have been constructed according to the plan *said* to be adopted in Wales and elsewhere; persons claiming experience in the business have been employed, but all has been unsuccessful. In large sections of our state ore of the finest quality, coal in the utmost abundance, lime-stone of the best kind, lie in immediate contiguity, and water power is within the shortest distance of these mines of future wealth. The prices which are obtained for iron on the western waters are double those of England, the demand is always greater than the supply; and thus nothing but knowledge of the art of using these rich possessions is wanted.

But it is not only in the knowledge of the production of iron, that we are behind the country you are about to visit. In the art of casting, in making bar-iron, the improved state of knowledge you will find in England has given her a superiority, which would enable her to command our own market, but for the protection the manufactures have in the tariff.

We desire your attention to the following inquiries on the subject of the manufacture of iron.

1st. What is the most approved and frequent process for coking coal, and what is the expense of the process per ton or chaldron?

2d. In what manner are the arrangements or buildings, if any, constructed for the coking of coal, obtaining drawings and profiles thereof.

3d. Are there different modes of coking coal, and if they have any differences in principle, what are they?

4th. In what manner are the most approved furnaces for the smelting of ore constructed? Drawings and sections of the same to accompany the information which may be obtained upon this inquiry.

5th. The mode of drawing off the pigs, and the plan adopted

for keeping a supply of ores, if peculiar or superior to that used in this country.

6th. The making of castings. Is there any process by which castings are made *soft*, so that they may be substituted for brass or copper, if there is, what is that process?

7th. What is the most approved construction of a foundry, and what the most approved mode of casting? Drawings, profiles, and minute descriptions to accompany the information you may collect upon these inquiries.

8th. What is the most approved mode of making bar iron, and what is the most approved machinery used in the same? drawings, profiles, and a description of the same are requested.

9th. Is the *Anthracite coal* used in any processes for making or using iron? If it is, all the information of the mode of its use will be of the greatest importance.

10th The best mode of making steel? Where is it made, from what quality of iron? How the English blister is prepared, the process for its production, does it require a peculiar kind of iron, or does the quality of the best steel depend exclusively on the mode of carbonating the iron?

11th. At what stage of the process of converting bar iron into steel, does the agency of the coke commence. Is charcoal used in any of the processes for making steel? When, how, and to what extent is it used, if at all?

12th. What is the construction of a furnace for making steel upon the best and most approved principles? What time is required to convert a given quantity of iron into steel? The degree of heat, the material from which the iron absorbs the carbon, how prepared?

13th. What proportion of the English bar iron is made at present by *rolling*, and what by *hammering?* What is the opinion of enlightened practical men as to the comparative merits of each?

14th. Has the English iron been so far improved, as to admit of its being used in the manufacture of cast steel in competition with the Swedish? If so, from what ore is it obtained, and by what process? Is the coke of bituminous coal used in this process?

We submit for your prudent consideration, some suggestions on the subject of these inquiries, assuming the fact that they cannot be prosecuted by you to the full extent. We are willing, on the part of the Society, to authorize you to expend, in obtaining all the information which they seek for, the sum of one hundred pounds sterling. This sum might induce some individual to prosecute in detail the investigations, and collect the information so much desired. This will not be an unprofitable expenditure by the Society. But one gentleman interested in the manufacture of iron is a member of the Society, and we shall take care to reimburse the Society from among those who manufacture this great staple of the state. before we communicate what you shall transmit to us.

You are aware of the importance which is here attached to the use of *anthracite* coal in the smelting of iron. To the eastern portion of our state full and accurate knowledge of this art, if it exists in Ireland or England, would be productive of the richest results. Should you find that anthracite coal is in use in making iron from the ore, and any one, with perfect skill in the art, and of good character, will come to this country for the purpose of obtaining employment in the making of iron with the anthracite coal; you may agree that his passage to Philadelphia shall be paid by the Society, and you may give him every assurance of further patronage.

Rollers of Cast Iron.—How are they cast and hardened?

Rollers of Brass or Copper for Calico Printing.—There is a patent for making these. Endeavour to get at it, and acquire all the information which will enable one skilled in the art, to cast them here. This is to be the subject of a special report, accompanied with a model, if you can procure one.

Machinery.—Useful machines of all kinds will command your attention. Those which can be employed in connection with canals and roads will be of the highest importance. The letter of Professor Keating, suggests inquiries on the subject of steam boats used for canals. These may become very important here, and steam boats with small draughts of water will be required for some of our rivers, if they shall be made navigable by dams.

The letter of Thomas Butler, Esq, suggests for inquiry, the mode for diffusing heat in vessels. That of Mr. Sellers, to the best machine for preparing and dressing flax. We beg your attention to these subjects. As you have the aid of Mr. Kneass, your pupil, we have less hesitation in claiming from you frequent communications of your progress and success. These, if favourable to the purposes of you agency, will give confidence to the members of the Society, and they will also justify our claims on the citizens of Pennsylvania, to aid us by pecuniary contributions. You may rely on the exercise of a careful and guarded discretion in making public, by means of the press, the contents of your correspondence. To the members of the Society your communications will always be open, but their publication in any other form, will be the result of proper deliberation.

During your absence we shall have frequent occasions to communicate with you. We shall forward all our letters to Messrs. Curwen and Hagarty of Liverpool, and we would suggest that you, at all times, place with them your address, and through them, by our Philadelphia packets, communicate with us, directed to the Corresponding Secretary.

By the resolution of the Society, passed on the 3d of February last, you were appointed the Agent of the Society, to proceed to Europe, for the purpose of prosecuting the inquiries stated in your instructions. Your compensation for an absence of twelve months on the duties assigned to you, is to be $ 2500, of which 400*l.* ster-

ling shall be placed to your credit in England, at par, and the residue of this sum to be paid to you or your order here.

In your instructions you are authorized to expend one hundred pounds sterling for obtaining correct information relative to smelting iron ore, and the improved manufactory of iron.

The Society, by a resolution adopted at the meeting held on the 17th March, instant, have authorized you to expend one hundred pounds sterling, for memoirs, publications, models, drawings of useful machines, and authentic information on all subjects which are important in this country.

You will take due notice of these appropriations, and we beg leave to recommend a judicious economy in the expenditure of this money, and that you keep an accurate account of the same, which you will render to the Treasurer of the Society.

The arrangements in relation to the funds to be placed at your disposal in England, and the payments to be made here, are left with the Treasurer, Mr. White, who will attend to the same.

We desire an acknowledgment of the receipt of these instructions, and your assent to the same. With every wish for your success in the performance of the important duties assigned to you, and of a happy and safe return to your family and friends, we are with great esteem and respect,

Your obedient servants,

MATHEW CAREY,
RICHARD PETERS, Jun.
JOSEPH HEMPHILL,
STEPHEN DUNCAN,
} *Members of the Acting Committee.*

Attest,
GERARD RALSTON, *Corresponding Secretary.*

Extract of a letter addressed to William Strickland, Esq. on the 19th Sept. 1825.

"*Canals* and *Railways* present the most important of all subjects for your attention. Upon every matter connected with both, you will be expected to be well informed; and if you shall have to decide between them, you must be able to furnish the facts and circumstances by which the decision shall be produced. Much excitement prevails in this State upon the question whether Railways are superior to Canals; and the inquiries which are in progress in relation to them, are in the hands of men of ingenuity and well disposed to the cause of Internal Improvement. It is however feared by many, that the question between Canals and Railways will have an injurious influence in Pennsylvania, as it will divide the friends of the cause of improvement, and thus postpone.

if not prevent the commencement of the great work. The importance of correct information in relation to them is thus greatly increased.

"Those who have not had the same opportunities of testing the advantages of the mode of transportation which you now prefer, will pause, unless you furnish facts and arguments of an entirely conclusive character.

"Do you contemplate confining Railways to the transportation of goods and merchandise? or do you propose they shall also be employed for the carriage of passengers? If both, must there not be not only a double Railway for the merchandise, but also a double Railway for passengers? If these are to be formed, will not the expense of a Railway be very considerable, say, if iron is at £14 per ton—not less than £8000 sterling per mile. Ought wood to be used as the foundation for the rails, thereby reducing the size of the rails, as has been suggested by some persons?

"Do you contemplate the use of Locomotive Engines on Railways in Pennsylvania?

"Have you considered the difficulties and obstructions which the necessity to use steam engines to overcome ascents will produce; as these machines will require engineers and skill to use them, and to repair them; and many of them must be located in the midst of mountains, far from settlements, and equally distant from the habitations of those who are competent to repair them?

"The present establishments in the United States for the making of iron find a market, for all the iron they make, at high prices. Pig iron at Pittsburg is 40 dollars per ton. Bar iron, 125 dollars per ton. Would not the demand for iron for a railway from Philadelphia to Pittsburg increase the price, and could that demand be supplied within a reasonable time?

"These propositions are not suggested as insurmountable difficulties, but as specimens of the matters which will be inquired of you when you return. It is not for the Pennsylvania Society to adopt a preference for any particular plan of improvement, or to discourage investigation. Its object is the improvement of the state by the best plan; and, this accomplished, the members will be fully compensated for their contributions towards the same."

To the Pennsylvania Society for the Promotion of Internal Improvement in the Commonwealth.

GENTLEMEN,

The queries proposed to me by the Acting Committee, respecting rail-roads, contained in a letter of the corresponding secretary, dated September 19, 1825, have been duly considered by me, and, although I am urged to furnish facts and arguments respecting them of an entirely conclusive character, I must be excused from any intention to offer opinions which may have a tendency to excite or divert the public from improving the State upon the most judicious plan:—I am assured it is not the object of the

Society to give a preference to any particular plan of improvement, or to discourage investigation.

If an extensive railway should be proposed in Pennsylvania, it ought to be *a double line of edge-rail*, and calculated for the use of locomotive engines; for with *them only* as the moving power, consists any decided advantage over other modes of conveyance; I would form this double line of rail-road, at least 10 feet apart, making it as nearly *level* as possible, or at any rate not to exceed 1-10th of an inch rise in the yard. It should be constructed for the transportation of goods, merchandise, and lumber of all kinds.

If the country through which the road has to pass be undulating, or hilly, I would seek a level, to its greatest extent, by *winding round the hills, cutting through them, or tunnelling*, which ever might prove, from accurate survey, to be the best and most expedient: I would avoid the frequent construction of *inclined planes*, with fixed engines, and carry the *level* or slightly inclined road as far as possible in *successive platforms*, or *level stages*, without assuming a higher level, until it became necessary to overcome a lift of not less than 50 feet at once; this would of course, depend upon the nature of the ground upon which a second *extensive level* could be established; and so on, carefully avoiding all *small lifts* by inclined planes:—I must here be permitted to remark, that this plan does not differ much from that pursued in the location of a Canal; and that it will be admitted to be evidently cheaper to cut through a hill or form a tunnel for the passage of a rail-road, than for that of a canal; and again there is no country, however its surface may be varied, but what will afford as many facilities for the execution of the one, as the other:—If therefore a succession of level platforms, or stages of rail-road be established, and locomotive engines are made to ply upon each stage, it may be practically proved that there can be no greater difficulty in producing a transit of the *same quantity of goods or merchandise*, at the rate of *six miles* an hour, than is usually conveyed upon a canal at one-third that speed:—It is mainly from the application of *steam to machinery as the motive power*, that a decided advantage is to be gained in the transportation of goods upon rail-roads; and if *speed* is at all desirable, then, they are the best means by which it can be certainly, and most economically obtained:—The practical efficiency of the locomotive engine, and its superiority over horses working upon Canals, was fully proved by the evidence adduced before the committe of the House of Commons, on the Liverpool and Manchester Railway bill.

The stationary engine and inclined plane afford equally as speedy and *simple* a mode of communication between two level stages, and may be constructed with a lift of fifty feet in a thousand feet, for half the sum required to overcome the same elevation by lockage. Engines require, perhaps, more skill in *attendance and repairs*, than locks; and this may be urged as an argument against their use, "in the midst of the mountains in Pennsylvania, far from the settlements and habitations of persons who

may be competent to repair them;" to this objection, I will only add that the management and repairs of locks and their sluices, in the same situations, would be attended with nearly the same difficulties: but I take it for granted that there must be an attendant to either species of machinery who properly understands the subject. The extra power of the stationary steam engine, may be employed for manufacturing purposes; such as grinding grain, sawing timber, &c. &c. *If wood* be used as the foundation for the rails, *its depth* in order to afford sufficient strength for the support of a great weight, would be calculated to elevate the rails too high above the surface of the road, to allow a sufficient discharge for the rain water under them; and if the rails be reduced in size, and inserted in the wood, or bolted to it, it would be impracticable to give them an equal and uniform bearing throughout their *whole length;* and they would from this cause inevitably break; it is most essential that the *ends only* of the rail should *bear;* and hence a proportionate weight and strength of metal should be given to the intermediate parts.

I have no doubt but a demand for iron sufficient to form a railway from Philadelphia to Pittsburg would increase its price considerably in Pennsylvania; and that there would be a great disadvantage experienced from the impossibility of the state being able to supply that demand within a reasonable period of time.

Various propositions may be suggested as *untried* and insurmountable *difficulties*, in the management and conduct of railroads, because they have never yet been used as a means of general or distant intercommunication; these are only to be understood by the fact, that they have been satisfactorily proved, upon a *small scale*, comparatively speaking: but they have been practically applied to varied surfaces of country, and there now appears in England, to be a strong confidence among men of intelligence and capital, that there is in this country a necessity for a *general extension* of their advantages to facilitate the operations of *trade and commerce.*

It will be admitted, however, that there are situations where canals cannot be formed; and where, if formed, they may be ruinous and abortive experiments; but these can rarely occur with railways properly constructed: a railway will always be, *at least, a road.* In making the foregoing observations, I do not wish to be understood, as the champion of this species of conveyance, in opposition to the known advantages of canals; but simply as expressing in common with others, an honest opinion derived from a personal investigation of *facts*, which may be presumed to have been exhibited, *perhaps*, upon too *small a scale* in England, to admit of an unequivocal recommendation to your society, or the people of Pennsylvania, as the subject of *preference or experiment.*

I enclose you the report of the committee of the Birmingham and Liverpool Railway Company, in which you will perceive the causes which have produced a delay in the execution of *their*

work; and the confidence they still maintain of its high national importance.

Respectfully submitted by your obedient servant,

WILLIAM STRICKLAND.
Engineer.

Liverpool, October 20, 1825.

Report of the Committee of the Birmingham and Liverpool Railway Company.

[Referred to in the preceding letter of Mr. Strickland.]

The Committee of the intended *Birmingham and Liverpool Railway Company*, regretting that unforeseen circumstances have hitherto prevented their addressing the Subscribers, deem it incumbent on them now to state, that in conformity with the instructions and powers given to the Committee, they caused a Line of Railway to be surveyed from Birmingham to Liverpool, with Branch Lines to Chester and the Staffordshire Potteries; and the requisite preliminary measures having, after great exertions and labour, been completed, a Petition for leave to bring in a Bill to effect the objects of the Company was presented to the House of Commons early in the last Session. The Petition experienced great opposition, originating in causes which cannot fail to be readily understood and appreciated by the Subscribers; and after a protracted struggle of three weeks, in the Committee to which the Bill was referred, and in the Select Standing-Order Committee, (a circumstance altogether new in the annals of Parliament,) the Petition was rejected, upon the alleged ground of the omission of a single Township in the Notices, although the Parish in which such Township was locally situated was regularly inserted therein.

The promoters of the Bill were thus precluded the opportunity of demonstrating before Parliament the utility and practicability of their undertaking, an opportunity which they had a right to expect would not have been objected to by their opponents, who uniformly asserted that the plans of the intended Company were fallacious and impracticable.

The Committee have, however, great satisfaction in stating that the practical efficiency of the Locomotive Engine, and its superiority over horses working upon Canals, was fully proved by the evidence adduced before the Committee of the House of Commons on the Liverpool and Manchester Railway Bill.

The inquiries also which the Committee have made, and the additional information which they have obtained in pursuing the objects of the company, convince them they can redeem the pledge originally given; namely, that the railway, when completed, will effect a more direct, expeditious, and cheap means of communication than at present exists for the transportation of produce and merchandise between Birmingham, Liverpool, Chester, and the

Potteries, affording at the same time a liberal remuneration to the proprietors. And further, the Committee have no hesitation in asserting, that as a part of a great and direct line of communication from London to Liverpool, and thence to Ireland, their undertaking is peculiarly an object of *National Importance*, independent of the consideration that every new or improved mode of conveyance is, in itself, a legitimate object of public interest. They cannot omit also to bring under the consideration of the subscribers the fact, that the proposed application of this new principle of transit has already operated most beneficially by the great alterations and improvements which have been projected in different canals, exposed to the competition of railways, and in none more strikingly than in the instance of the Birmingham Canal, where, in addition to the decision of the Company to improve their line from Birmingham to Wolverhampton, at an expense of upwards of £ 100,000, they have, with a view of opening a more direct communication with Liverpool, projected the formation of a new proprietary to cut a canal from Wolverhampton to Nantwich, a distance of about forty miles, upon or near the very line of the proposed railway, thereby giving a direct negative to the assertion of the opponents of the railway, that the present lines of transit are sufficient.

Convinced, therefore, of the utility and practicability of their undertaking, and of its high national importance, convinced also that the expectations of advantage which have been held out to the Proprietors will be fully realized, the Committee have felt it their duty to decide upon renewing their application to Parliament the next Session; with which view they are prosecuting the necessary measures, and they have great satisfaction in stating to the Subscribers that they possess ample funds for the purpose.

The Committee, since the rejection of the petition by the Committees of the House of Commons, have been engaged in making up the Accounts of the Undertaking, and have prepared a full statement of the receipts and expenditure. The Subscribers are informed it may be inspected on application to the Solicitor, or the London Agents, or to the Chairman of the respective Local Committees.

The Committee have further the satisfaction of stating, that the delay which has been thus imposed upon them, will, in some degree, prove of advantage to the measure; as it has afforded the Committee an opportunity of re-surveying their intended line, and of adopting such improvements as may be suggested by able and experienced Engineers.

Upon a review, therefore, of the whole proceedings, the Committee cannot doubt but they shall now succeed in laying down a Line of Railway, the evident advantages of which cannot fail to insure the sanction of Parliament.

Birmingham, Sept. 23. 1825.

OFFICERS OF THE SOCIETY

FOR 1826.

President.

JOHN SERGEANT.

Vice Presidents.

MATHEW CAREY,
PAUL BECK, JUN.
THOMAS BIDDLE.

Treasurer.

JOHN WHITE.

Recording Secretary.

ABRAHAM SHOEMAKER.

Corresponding Secretary.

GERARD RALSTON.

Acting Committee.

MATHEW CAREY,
RICHARD PETERS, JUN.
LEVETT HARRIS,
ABRAHAM SHOEMAKER,
JOSIAH RANDALL.

dup

PROCEEDINGS,

IN RELATION TO THE

WESTERN TERMINATION,

OF THE

PENNSYLVANIA CANAL.

PITTSBURGH.

1826.

PROCEEDINGS, &c.

It is well known that the people of Pittsburgh were strenuous and zealous in promoting the canal policy of Pennsylvania. They are now apprehensive that by an *implied* construction of the law, they will be placed, contrary to their wishes, in a situation relative to the great Pennsylvania Canal somewhat similar to that which Norristown and Pottstown occupy in relation to the Schuylkill Canal. Those two towns have been greatly injured by the trade passing on the opposite side of the Schuylkill, and Pittsburgh dreads a similar result, but in an infinitely greater degree, if the Pennsylvania Canal be taken to the opposite side of the Allegheny river.

That the views of the people of Pittsburgh may be more fully understood by the public in general, the following extract from the act of assembly is given.

"*Be it enacted*, &c. That the Commissioners, &c. are hereby authorised and empowered, in behalf of this state, immediately to locate and contract for making a canal and locks and other works necessary thereto, from the river Swatara at or near Middletown to or near to a point on the east side of the river Susquehannah opposite the mouth of the river Juniata; and from Pittsburgh to the mouth of the Kiskiminetas;"

PUBLIC MEETING.

AT a very numerous meeting of the citizens of Pittsburgh, convened in pursuance of public notice, at the court house, on Tuesday evening, the 8th of June, JOHN M SNOWDEN, Esq. Mayor of the city, was called to the chair, and ROBERT BURKE, appointed secretary, when it was

Resolved By the citizens of Pittsburgh, in town meeting assembled, that the act of assembly providing for surveying and constructing a canal from the Susquehanna to Pittsburgh, has fixed the western termination thereof at this city, and that any construction of the law which would authorise the termination of the canal on the western side of the Allegheny river, and opposite the city, is a clear departure from its letter and spirit.

Resolved That this meeting will view with deep concern and regret any arguments which may be pressed upon the commissioners from any quarter, to confine the disbursement of the money already appropriated to the western side of the Allegheny river, inasmuch as it is understood that a proposition may be made at the very next meeting of the legislature, grounded upon such disbursement and the cost of an additional acqueduct, so to modify the law as to take the canal from Pittsburgh altogether.

Resolved, That in the opinion of this meeting the people of Pittsburgh, in common with their fellow citizens of the adjoining counties, have a right to ask for a strict execution of the law, providing for said canal and that the commissioners be respectfully requested to begin the same at Pittsburgh and to excavate from thence on the eastern side of the said river as far as may be practicable. They further respectfully intimate, that this request is made in the hope that the public anxiety on this subject may be quieted, and that the funds already given may not be applied so as to continue and strengthen the expectations entertained of persuading the next legislature to change the termination of the canal

Resolved, That William Wilkins, Richard Biddle and Harmar Denny, Esquires, be appointed a committee to attend at Harrisburg, in behalf of the people of this city, on the 15th of this month, and there to confer with said commissioners upon the subject of these resolutions; and further to communicate to the said commissioners, the earnest request of the people of this city and its vicinity, that the route and western termination of the canal may be examined by the said commisioners in person, before the same be finally decided upon and the excavation thereof commenced

Resolved That the committee above named shall have power to fill any vacancy in their body.

Resolved, That copies of these proceedings signed by the Chairman and Secretary, be furnished to each of the Canal Commissioners, and that the same be published in the different papers of this city.

JOHN M. SNOWDEN, *Chairman*.

Attest—R. BURKE, *Secretary*.

The following correspondence between the committee appointed at a town meeting of the citizens of Pittsburgh, held on the 8th of June last, on the subject of the termination of the western section of the Pennsylvania Canal, and the President of the Board of Canal Commissioners, is published with a view of reporting to the citizens of Pittsburgh, the manner in which the committee discharged the duties assigned to them. Messrs. Wilkins & Biddle, with whom Mr. Denny was originally associated, not being able to attend substituted Mr. Baldwin.

Copy of a letter addressed by Messrs. Denny & Baldwin to John Sergeant, Esq. President of the Board of Canal Commissioners.

We have the honor to present, on behalf of the citizens of Pittsburgh, certain resolutions adopted by them, at a large town meeting, on the subject of the western termination of the Pennsylvania Canal. In discharging this duty, permit us to express to you the high regard entertained for yourself and the very respectable board over which you preside, by the citizens of Pittsburgh, and to assure you, that these resolutions, containing a declaration of their sentiments, have been caused solely by a most anxious concern which they feel in a measure of vital importance to them; and that there was not the slightest disrespect intended towards any member of the board. The intensity of their feelings on the subject, can be measured only by the magnitude of their interests, which they believe to be in great jeopardy. Of these interests, the board can form a tolerably correct estimate, from a few facts in relation to the population, trade, and manufactures of Pittsburgh, as recently ascertained and published by Mr. S. Jones.

It appears that the city and adjacent villages (omitting Allegheny Town) contain upwards of twelve thousand inhabitants, actively engaged in every variety of occupation. The annual value of their manufactures is stated at two and a half millions of dollars; and for the year ending on the 1st of April last, the imports amounted to $2,119,000, and their exports for the same period

amounted to $2,788,276, of which about $1,000,000 appears to have been of foreign manufacture. From these important facts, it is obvious, that an immense capital is vested in ground, buildings, manufacturing establishments, fixtures, machinery, &c. Allegheny town contains, including residents in the vicinity, 702 inhabitants, some of whom carry on their business in Pittsburgh. It is firmly believed, if the termination of the canal be taken from Pittsburgh to the west side of the Allegheny river, that the business and improvements of the city, will be materially affected by the change; and an injury inflicted upon the inhabitants, to an amount far exceeding the cost of an aqueduct, and indeed of the whole western section of the canal, as the trade now carried on in Pittsburgh would be transferred to the opposite side of the river.

It may be said, that no public improvement of the kind can ever be made without interfering with the interests of individuals in a greater or less degree at some point; and that for the public good of the state they must be sacrificed. This is all very true, and the citizens of Pittsburgh have never witheld their obvations from the altar of public good. In war and in peace, in prosperity and adversity, they have always decidedly and actively advocated, and are always ready to promote, the grand undertaking of the state, which has been entrusted to your direction. They have full confidence in the commissioners and engineers, but they cannot silently acquiesce in a proposed deviation from the law, relative to the western termination of the canal, when the consequences will be so seriously detrimental to them, and without any advantage comparatively to the commonwealth. It cannot promote the public good to terminate the canal at a point where it can be even most conveniently effected, when by doing so, an injury infinitely greater than any benefit expected from the measure will be done to a large community.

Other interests, besides those of Pittsburgh, are involved in this matter.—Two-thirds in extent, and about three-fourths of the population of Allegheny county, together with Washington, parts of Westmoreland and Fayette, the richest western counties, are concerned in making the termination of the canal at Pittsburgh. This will satisfactorily appear from an inspection of the state map.

It is much to be regreted, that this point has become a subject of discussion; and it is still greater cause of regret, that any idea has occurred of suspending the whole or any part of the work on the western section. If the subject be left open for legislative interference, the opponents of the canal policy may revive, with increased strength, and defeat the measure altogether.

The citizens of Pittsburgh most ardently wish the commissioners to adopt the location from Pittsburgh to the Kiskiminetas; and as soon as practicable, place under contract so much as they may deem expedient, commencing at Pittsburgh, and crossing the Allegheny at the points designated by the engineer. To begin at Pittsburgh, is to begin at a point not only designated in the law, in language in itself too clear to admit of construction; but by a reference to the preamble, pointed out by the legislature as one section of the canal "which may be immediately begun without the danger of error." In expressing, therefore, their confidence on this subject, the citizens of Pittsburgh only reiterate the strong language of the preamble and the law. If the immediate commencement of the work at the point on the western section just mentioned, can be done without danger of error, there is much reason to believe that there will be, in the opinion of the legislature, great danger, not only in the location,

but in the commencement of the work at a point not called for in the law; but at one which may necessarily lead to the exclusion of both points named in the law, and the entire location on a route, no part of which seems to have been in the contemplation of the commissioners at the time of making their report or of the legislature at the passage of the act. That the beginning at or near Pine Creek, will eventually lead to the belief that it is not intended to make Pittsburgh a point in the route of the canal, will be evident from the want of any other reason for such a place of beginning.—That there is authority for making Pittsburgh the beginning point, without any further legislation, is undoubted. None other than questions of expediency can operate on the minds of the commissioners, where the power is conceded, and we cannot, therefore, but consider the suggestion of commencing at a point on the western bank of the river, five miles from the city, as a very unequivocal indication of a strong inclination of completing the canal without touching Pittsburgh. If, in their wisdom, the legislature should, by some future act, authorize such a measure, the people would be bound to acquiesce: but it cannot be expected that they could, without remonstrance witness it under the present law. Many of the present generation have stood as sentinels on the bank of the Allegheny, to protect their families and property from Indian depredations. Their enterprise and industry have brought the town to its present importance; the great establishments have been the creations of adventurous men, who had no capital but their industry, and unaided by public aid or protection, have struggled against difficulties which would have been too great for ordinary efforts. The citizens of Pittsburgh make no pretensions to any uncommon prescience as to the effects of a canal exclusively on the western bank of the Allegheny; but having witnessed for twenty-five years the gradual progress of our commerce and manufactures; having experienced every fluctuation from their infancy to the most unexampled success, and from thence descending through all the points of depression to the lowest; they do not think they arrogate to themselves too much in believing, that experience has so well pointed out to them the sources of danger as well as of wealth that they may be allowed to have some confidence in their own opinion. That opinion has been deliberately formed, and we feel it our duty to express it candidly and freely to the board, that the termination of the canal on the western bank of the Allegheny would be productive of more extensive and irreparable injury to Pittsburgh, than any other measure which could be devised. Of the correctness of this opinion, the best and safest judgment must be formed from observation; and to enable the board fully to appreciate, and correctly determine on the various opinions which have been or may be formed on the subject, the people of Pittsburgh would be much gratified if this board, or a quorum, could, consistently with their convenience and public duties, make at that place, such personal examination as would lead their minds to a satisfactory conclusion.

In a matter which has excited so much personal and local feeling, we are well aware that many imputations have been made, ascribing to individuals motives unworthy of themselves; and that representations have been made, ascribing the interference of the citizens of Pittsburgh, to a spirit of hostility to the canal policy. For ourselves and them, we disclaim all such feelings, and can with confidence appeal to the well known state of public feeling in our place; to the uniform efforts of the people in public meetings, and in the legislature, to aid in the efficient prosecution of this great work. We also distinct-

ly disclaim any desire to retard, or in any manner embarrass its commencement. The first and last wish of the people is, that the work may be commenced at Pittsburgh, and carried to Kiskiminetas by such route as the engineer may designate, and that the law be promptly and fully executed; and in doing this, no part of the state will more freely contribute their best efforts in aiding and supporting, every act and measure which may tend to acilitate the great object. To effect this, we can discern no mode so well adopted, as to begin the work either at the Monongahela river, or the boundary of the city, on the Allegheny, as the board may think either to be the point designated by law, & progressing in such direction as the board may think best, proceed at once to its completion. In keeping this course the law is followed—no responsibility is incurred, no opposition is excited, the great object will be attained in a manner happily calculated to combine public utility with general satisfaction, and the thanks of the country to those whose labor & skill have created a work of so great importance to the prosperity of the state. The great anxiety prevailing in Pittsburgh, in relation to the subject on which we have addressed you, renders it extremely desirable that we should be able to communicate to the citizens, on our return, the course which the board will pursue. Something of this kind will be expected.

HARMAR DENNY,
HENRY BALDWIN.

Harrisburgh June 19, 1826.

Messrs Harmar Denny & Henry Baldwin.

Gentlemen—I enclose you, by direction of the board of canal commissioners, a certified copy from their minutes, containing the measures they have adopted in reference to the commencement of the western section of the Pennsylvania canal.

Very respectfully, your most obedient servant.

JOHN SERGEANT.

AT a meeting of the canal commissioners of Pennsylvania, held in the borough of Harrisburgh, on the 19th of June 1826, the following preamble and resolutions were adopted,

The board being fully satisfied, by the report of their engineer, and by all the information they have obtained, that from the Kiskiminetas to the mouth of Pine creek, it is impracticable to make a canal on the east side of the river Allegheny, but at an enormous expense, and that from the nature of the ground such a canal will be exposed to continual destruction from slips from the hills, against which it cannot be so defended as to afford any security for the navigation. And being also satisfied, that a canal may be constructed on the west side at less than half the expense, and that the ground is favourable and safe: but the board being in doubt whether from Pine creek it may be best to follow the eastern or western bank of the river, and believing that a decision of this point will require further examination therefore,

Resolved, That the board will now proceed to locate the canal from the Kiskiminetas to a point at or near the mouth of Pine creek, and to execute the work as speedily as the provision of the law will allow, and for that purpose will immediately advertise for contracts.

Resolved, That Mr. Strickland be requested, at as early a day as his engagements will permit, to join with Mr. Roberts in examining the route from

Pine creek down to Pittsburgh, on both sides of the Allegheny, and in reporting plans and estimates of such canal and the necessary aqueducts.

Resolved, That the board will meet at Pittsburgh, on the 2d day of August next, there to examine and decide upon the route from Pine creek down to Pittsburgh.

Resolved, That from Pine creek down, the advertisements invite proposals on both sides of the Allegheny river, including an aqueduct across that river, at or near to Pine creek, as well as other necessary aqueducts.

A true copy from the minutes of the board,

JOS. M'ILVAINE,
Secretary of the canal commissioners.

Messrs. Denny & Baldwin to Mr. Sergeant.

Harrisburgh, June 19, 1826.

Dear Sir—In referring to the resolutions which the board was so good as to communicate to us to-day, we think there may be some reason to fear, that their precise import may be misapprehended. In order to avoid this, we take the liberty to request you to state, whether it is the meaning of the board, that the canal is to be terminated at Pittsburgh at all events—leaving its location on the eastern or western bank of the Allegheny, and the location of the aqueduct across the river at Pine creek, or a point lower down, to be decided at the meeting on the 2d of August, or, whether the board intend to postpone till the meeting in August, a decision as to the termination of the canal, at Pittsburgh, or the opposite side of the river.

Harmar Denny,
Henry Baldwin

Harrisburgh, June 19, 1826.

Gentlemen—I have received and laid before the board, your note of this evening, and am directed in reply, to say that the board has not decided any thing in relation to the western section of the Pennsylvania canal, except its location above Pine creek, which is to be on the western side of the Allegheny river. The route of the canal below Pine creek, as well as its termination, will remain, undecided till the meeting of the board at Pittsburgh, and in the mean time the engineer will make such examinations as may be necessary for a correct decision. In pursuing this course, the board has been governed by a desire to prosecute the work as rapidly as a just regard to the interesting considerations presented by it will allow.

Very respectfully, your most ob't serv't.

John Sergeant.

Harmar Denny, & Henry Baldwin, Esqrs.

It is certainly much to be regretted that there should exist in the minds of the Commissioners any hesitation about taking the canal to Pittsburgh. It cannot be good policy, nor will the interests of the state require the Commissioners to adopt any measure calculated to impair and eventually ruin the business, and depreciate immensely the value of property, in this city of enterprizing and industrious mechanics; if there should be the least doubt about the effect being injurious to Pittsburgh, the measure ought not to be adopted, even if a plain construction of the law would authorise it. Let Pittsburgh, as the law has given the

city a claim to the termination of the Canal, enjoy the benefit of it. If positive words in the act of assembly do not authorise the Commissioners to terminate the Canal at Pittsburgh, then future legislatures must declare expressly, not only what they do mean but also what they do *not* mean, or the rights of the people will be frittered away in this age of refinement and *implied constructions*.

If "Pittsburgh" can mean, by construction, Allegheny-Town, or the north west side of the Allegheny River opposite Pittsburgh, then black may mean *white*.

It cannot with reason be pretended that the Legislature mentioned, "Pittsburgh" and "the mouth of the Kiskiminetas," as indefinite terms—to mean any thing or nothing. If it be a compliance with the law to terminate the canal at Allegheny town, opposite to Pittsburgh, the same rule of construction would authorise the commissioners to terminate the eastern end of the western section at any point opposite "the mouth of the Kiskiminetas." If "Pittsburgh" as a point actually and distinctly designated in the law can be dispensed with, so may the other point, viz. "the mouth of the Kiskiminetas." Would Westmoreland county think this a proper construction of the law, although by it the expense of an aqueduct would be saved to the state? Would any man of common sense think it a compliance with the law? No it would amount to an evasion of the whole law. If express words of a law are to be rendered nugatory by an implied construction and that anti-republican and dangerous doctrine brought to bear upon the rights of the citizens of Pittsburgh, it is high time for the people to interfere, and the interposition of the Legislature will be required to prevent such an unwarrantable exercise of power.

COMMUNICATIONS

FROM THE

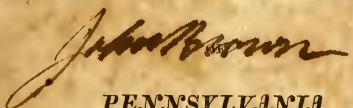
GOVERNOR,

ACCOMPANIED WITH A

REPORT OF THE BOARD

OF

Canal Commissioners



PENNSYLVANIA.

AND

DOCUMENTS ACCOMPANYING THE SAID REPORT.

No. 2.

Read in the House of Representatives, February 7, 1827.

Harrisburg:
PRINTED BY JOHN S. WIESTLING.
1827.

ERRATUM.

Page 4, 11th and 12th lines from the bottom, for "Conococheague and Conococheague," read "Conococheague and Conodoguinnet."

MESSAGES FROM THE GOVERNOR,

AND

LIST OF DOCUMENTS

Annexed to the report of the canal commissioners.

MESSAGE 1.

To the Senate and House of Representatives of the Commonwealth of Pennsylvania.

GENTLEMEN,

I have the honor of transmitting to the House of Representatives an additional report of the board of canal commissioners, presented to me last evening, with copies of the documents numbered 1 to 5, inclusive, in the list hereto annexed. The remaining documents will be furnished as soon as copies can be prepared. I also transmit to the House of Representatives, for the use of both branches of the Legislature, the several drafts and maps that accompanied the report of the commissioners.

J. ANDW. SHULZE.

Harrisburg, February 7, 1827.

MESSAGE 2.

To the Senate and House of Representatives of the commonwealth of Pennsylvania.

GENTLEMEN,

I have now the honor of transmitting to you, copies of the remaining documents presented with the report of the canal commissioners.

J. ANDW. SHULZE.

Harrisburg, February 9, 1827.

LIST OF DOCUMENTS, &c.

No. 1. A report on the Susquehanna and Potomac route by John Mitchell, Esq.
No. 2. A report on the French creek feeder by major D. B. Douglass.
No. 3. A report on the survey along the Allegheny from the mouth of Kiskeminetas, to the mouth of French creek, by James Geddes, Esq.
No. 4. A report on a survey of the North Branch of Susquehanna, by John Bennet, Esq.
No. 5. Remarks on the North Branch survey, by Judge Scott, a member of the board.
No. 6. A report on the survey of the Northern route between the eastern and western waters, by James Geddes, Esq.
No. 7. Reports on the survey of the Juniata route, by Canvass White and George T. Olmstead, E q.
No. 8. Extract from the minutes of the board in relation to the North Branch survey.
No. 9. Report on the upper level of the eastern division of the Pennsylvania canal, by Wm. Strickland, James Geddes, N. S. Roberts and Canvass White, engineers, in the service of the board.
No. 10. Resolution of the board of canal commissioners to extend the eastern division of the Pennsylvania canal, to a point at the upper reef of Foster's falls, near Clark's ferry, and raise the level thereof, approved by the engineer, and consented to by the Governor.
No. 11. Report of the committee appointed to superintend the subject of releases, on the proposed lines of communication between the eastern and western waters.

OFFICE OF THE CANAL COMMISSIONERRS,
Harrisburg, February 6, 1827.

SIR,

I have now the honor to present to your Excellency, a further report of the canal commissioners of Pennsylvania; made in obedience to the eighth section of the act of 11th April, 1825.

Very respectfully,
Your obedient serv't.

WM. DARLINGTON,
President of the Board of Canal Commissioners of Pennsylvania.

His Excelleney, J. ANDREW SHULZE,
Governor of Pennsylvania.

FURTHER REPORT

OF THE

Canal Commissioners of Pennsylvania.

The canal commissioners of Pennsylvania, in addition to their report of 12th December last, respectfully submit the following documents:

1. A report on the survey and examination of canal routes through Cumberland and Franklin counties, and by the Conococheague and Conewago and Monocosy and Conewago, with a view to connect the Susquehanna and Potomac rivers, by John Mitchell, Esq. accompanied with a draft and profile.
2. A report on the survey and location of a feeder from French creek to the summit level at Conneaut Lake, accompanied by drafts and estimates, by Major D. B. Douglass.
3. A report on the survey and location of a canal line along the Allegheny, from the mouth of the Kiskeminetas to the mouth of French creek, with drafts and estimates, by James Geddes, Esq.
4. A report on the examination of a canal route from Northumberland, along the North branch of the Susquehanna, to the New-York line, with drafts and profiles, by John Bennet, Esq.
5. Remarks upon the survey last mentioned, and upon the advantages to be expected from the execution of that work, by Judge Scott, a member of the board, to whom the superintendance of the survey was confided.
6. A report on the survey and location of a canal to connect the Eastern and Western waters by the Northern or Sinnemahoning route, with drafts and estimates, by James Geddes, Esq.
7. Reports on the survey and location of a canal and portage to connect the Eastern and Western waters by the Juniata route, together with drafts and estimates thereof, by Canvass White and George T. Olmstead, Esqs.

These documents are so full and satisfactory upon the subjects of which they treat, that nothing remains for the board but to notice, briefly, the results of each, and then make upon the whole together a few obvious remarks.

No. 1.

The Potomac and Susquehanna survey.

Mr. Mitchell was instructed to examine all the proposed routes between the Susquehanna and Potomac, contemplated by the act of 11th April, 1825, to ascertain with precision the prominent features of the country, the elevation of the respective summits, and how far they afford an adequate supply of water. He commenced his line of levels on the Su-quehanna, at the mouth of the Conodoguinet creek, and continued it up the latter stream to Green village, in Franklin county, which he found to be the most favorable summit between the Conodoguinnet and Conococheague. From his measurement it appears that a supply of water estimated at forty-three cubic feet per second, may be brought to this point by short and convenient feeders, a quantity believed to be sufficient for the supply of a summit of moderate length. The length of this line, from the mouth of the Conodoguinet to the summit at Green village, is about seventy-five miles, with an ascent of three hundred and sixty-five feet. From Green village Mr. Mitchell proceeded along the turnpike towards Gettysburg, to the summit of South mountain, which he found to be 823 feet above the Susquehanna, at the mouth of the Conodoguinet. Having satisfied himself that this mountain intervenes between the waters of the Conococheague and Conewago, and consequently that a navigable communication between them is impracticable, he proceeded to the summit between the Monocosey and Conewago, near the town of Gettysburg. This summit was ascertained to be 250 feet above the mouth of the Conodoguinnet, 115 feet lower than the summit at Green village. In order however to ascertain the comparative lockage which the two routes would require, the fall of the Susquehanna from the mouth of the Conodoguinnet to that of the Conewago must be added to the height of the Gettysburg summit, which would make them nearly equal in this respect. The measurements of the water near Gettysburg show an aggregate of only 23 cubic feet per second, a quantity insufficient for the supply of an active navigation. The Conococheague and Conococheague route is therefore the only one by which a communication can be expected between the Potomac and Susquehanna.

No. 2.

THE FRENCH CREEK FEEDER.

Major Douglass' report on this subject, will fully realize public expectation as to the capacity of French creek, to supply with water any future communication between the Allegheny and Lake Erie. In the driest season, a considerable surplus will remain after the most liberal allowance for the wants of the summit. No formidable obstacle to the construction of a feeder is present-

ed. The estimated cost from the point at which the water of French creek may be taken to the foot of Conneaut lake, a distance of 21½ miles, is $231,820, or about $10,800 per mile. This estimate includes a large aqueduct over French creek, and some items of extra expenditure at the two ends of the feeder, and supposes the whole work to be executed in the most durable manner. Exclusive of such items, the cost of the feeder will not exceed $8,500 per mile. It has been planned with a view to navigation, and will correspond in dimensions with the Pennsylvania canal as already begun. A moderate calculation of the trade which must pass on this canal from the fertile valley of French creek, will shew that besides furnishing a supply of water to the great line between the Ohio and Lake Erie, it must at no very distant period, become a source of profit to the commonwealth.

No. 3.

The Allegheny river.

The expense of a canal along the Allegheny river, from the mouth of the Kiskeminetas to the mouth of French creek, will be $1,754,000 for a distance of 88 miles, or about $20,000 per mile, including 235 feet of lockage. The valley of this stream presents greater difficulties in the construction of a canal than any section of country yet examined under the orders of the board. It is believed that the remaining distance, from the mouth of French creek to Lake Erie, affords such facilities as will greatly diminish the average expense of the whole communication; yet it is not deemed advisable to encounter the obstacles on the Allegheny river, until the relative expense of the other route from Pittsburg to Lake Erie, designated by law, has been distinctly ascertained.

No. 4.

North Branch survey.

The board have not the advantage of a professional opinion upon the expense of a canal from Northumberland to the New York line. Yet the great industry and care with which Mr. Bennet has executed the duty assigned him, and the very minute description he has furnished of the ground, enable the board, by comparison with similar portions of other lines which have been estimated by their engineers, to form an idea of its cost with a near approach to certainty. The whole distance surveyed by him is 16[illegible] miles, requiring 337 feet of lockage. The board are convinced that 8,000 dollars per mile, is a liberal allowance for the completion of this work, and that the whole may probably be accomplished at an average considerably smaller. Taking the largest sum for the sake of safety, the aggregate of its estimated cost is 1,288,000 dollars.

By the act of 11th April, 1825, the board is directed to examine the route of a canal from Philadelphia, northward, to the northern boundary of the state, towards the Cayuga and Seneca lakes. They are now of opinion, that the objects of the legislature in directing this inquiry, will be best effected, by a canal along the North Branch, having the same communication with Philadelphia as the other improvements projected on the Susquehanna. They have ascertained that the state of New-York is about executing a canal from Seneca lake to Newtown, on the Tioga, which is only sixteen miles from the Pennsylvania line. When, therefore, this short distance shall be added, there will be a complete communication between the Erie canal, at Seneca lake, and the mouth of Swatara, in a distance of 254 miles. The ascending lockage, from the Seneca lake to the Seneca summit, is 443 feet; and from that point to the mouth of Swatara, there is a descent of 552 feet, making the whole lockage 995 feet; of which 390 feet is within the state of Pennsylvania. The board have reason to believe, that a large amount of trade may be brought into the state, by this communication, which otherwise must find its outlet by the Erie canal; and that a profitable market for the coal of Luzerne and the neighboring counties, would be created within the state of New York.

No. 5.

Northern route from the Susquehanna to the Ohio.

James Geddes, Esq. was employed by the board early in the month of April last, and was instructed to locate the line of a canal along the whole of what is called the northern route, from the mouth of the Juniata to that of the Kiskeminetas. He performed this duty from the former point to the confluence of West creek with the Driftwood branch of Sinnemahoning, and then proceeded to examine the summit between the waters of West creek, and those of Clarion river. From these examinations, he became convinced that the supply of water could not be sufficient for a navigable communication, and believing that to continue the actual location of a canal line, in that uninhabited region, would cause useless expense: he returned to Philadelphia for further instructions. In addition to the ascertained scarcity of water on the summit, he stated the well known fact, that the country on the head of West creek, and for many miles down the Clarion, is entirely a wilderness, without roads or inhabitants, abounding with thickets of laurel almost impenetrable, and where in a low stage of water, necessaries for the support of life, can scarcely be obtained, at a heavy rate of transportion. Mr. Sergeant, then president of the board, and Dr. Patterson, to whom these communications were made, did not hesitate to direct that the further prosecution of the work on the summit and down the Clarion, should be postponed to a more favorable season, and that in the mean time, Mr. Geddes should examine the valley of the Alleghe-

ny, from the mouth of Kiskeminetas to French creek, that being important as a part of the northern route, and also with reference to a connexion between the Ohio and lake Erie.

At a meeting of the board in September, the provisional orders of the President were confirmed, and Mr. Geddes directed to carry a line of levels up the Clarion river, as soon as his operations on the Alleghany should be completed. The season, however, became so advanced, that the Allegheny survey only could be finished, without inadmissible delay in the preparation of his report. An extract from the minutes of the board, shewing more particularly their proceedings in relation to this subject, is hereto annexed.

The measurements of water on the West creek summit, made by Mr. Geddes, shew a quantity considerably less than those of last year. The whole supply is estimated by him at 1,168,432 cubic feet in 24 hours, or less than 14 feet per second; and so unfavorable is the country for the construction of feeders, that this quantity, extended over 40 miles of canal and feeder, would not be sufficient for soakage and evaporation.

Mr. Geddes divides the line actually located by him into two parts. The first or lower division, from the mouth of the Juniata to the mouth of the Bald Eagle, a distance of 107 miles, is estimated at $ 1,294,000, or about $ 12,000 per mile, having 255 feet of lockage. By the adoption of slack water navigation in two or three places, where the river passes through narrows, a saving of $ 263,000 may be effected, reducing the expense of this division to $ 1,065,019 or $ 9,481 per mile. The second or upper division from the mouth of Bald Eagle to West creek, 74 miles, is estimated at $ 1,326,772 or $ 17,690 per mile. It has 498 feet of lockage, and will be attended with considerable difficulty. From the mouth of West Creek, a portage must be resorted to for a communication with Clarion river. The line of such a portage has not been located for reasons already stated. Its length, however, cannot be less than 25 miles. From the termination of the portage on Clarion river, to its mouth, is at least 80 miles, by the course of the stream, which a canal line can never depart from. Although no actual location for this distance has been made, yet its character is sufficiently known for the purpose of a general estimate. Mr. Geddes is of opinion, that it will equal in cost the line on the Allegheny, or $ 20,000 per mile. It will certainly be safe to fix it for the present at $ 16,000 per mile; in all $ 1,280,000. The remaining distance from the mouth of Clarion river to that of the Kiskeminetas, is estimated by Mr. Geddes, in his report on the Allegheny, at $ 981,000 for 51 miles.

JUNIATA ROUTE.

The report of Mr. White shews that a canal may be made from the mouth of the Juniata to Frankstown, at a reasonable expense; and that the general character of the line is highly favorable. The cost for this distance of 132 miles, with 594 feet of lockage,

is estimated at $1,262,000, or about 9,000 dollars per mile. From Frankstown, a communication with the western waters must be formed by a portage, the line of which has been run, and its length ascertained to be 41 miles, with an ascent of 1591 feet, and a descent of 1348 feet, at an uniform inclination of one degree. It was found impossible to effect the actual location of a portage line during the present season, so as to furnish an estimate of sufficient accuracy. It seems, however, to be the opinion of Mr. White, that a good turnpike road for this distance may be made at about the ordinary expense of similar works in a mountainous region, and that a railway may afterwards be advantageously fixed upon the turnpike, as a foundation, if such a change be deemed advisable. It is evidently proper to suspend a choice between these two modes of improvement, until the examinations of another season shall have afforded additional light.

From Johnstown to the head of the Kiskeminetas feeder, as at present located, and which will become a part of the main canal, is 64 miles, with 368 feet of lockage, estimated at 836,138 dollars. or $11, 400 per mile.

Comparison between Northern and Juniata routes.

	Northern route.	Juniata route.
Whole distance to the mouth of Kiskeminetas,	337 miles,	249 miles.
Length of canal,	312 miles,	208 miles.
Portage,	25 miles,	41 miles.
Rise and fall of portage,	1130 feet,	2937 feet.
Cost, exclusive of portage,	$ 4,592,00	$ 2,098,138
Lockage,	1080 feet,	962 feet.

As an important element in such a comparison, it may be added, that the Juniata route passes, with the exception of its mountain section, through a settled country, abounding in mineral and agricultural productions, while about one half of the northern route, including nearly all the distance between the mouth of the Sinnemahoning and the mouth of Clarion, must be located in the midst of a wilderness, capable indeed of much improvement, but whose resources are not sufficiently known to form the basis of a safe calculation.

The board have now stated the prominent facts which appear by the documents annexed to this report. For further detail, they refer to the documents themselves, as containing a mass of valuable and particular information, which will amply repay the labor of a perusal.

Mature deliberation upon the whole together, has led the board to the following conclusions. Any system of internal improvement in Pennsylvania, must keep in view two leading objects:— 1st. To develope the natural resources, and cherish the industry of the commonwealth, by bringing all its important sections as near as possible to a sure and profitable market. 2d. The establishment of such a communication through the state, with the Ohio and Lake Erie, as may secure the commerce of the vast regions bordering on those waters.

As the best means of combining both these objects, they recommend the construction of the following works.—1st. A canal from the mouth of the Juniata, or a point opposite thereto, to Northumberland, thence up the north branch of the Susquehanna to the northern boundary of the state, and up the west branch to the mouth of the Bald Eagle.—2d. A canal from the mouth of the Juniata, up that stream to Frankstown, thence by portage across the Allegheny mountain to Johnstown, and thence by canal, down the Conemaugh and Kiskeminetas, to join the present location of the western division of the Pennsylvania Canal, at the head of the feeder. The aggregate of estimates for the canals above named, is $4,381,137. It is safe therefore to assume at this time $5,000,000, as the cost of the whole 464 miles of canal, and 41 miles of portage. When to these works shall be added communications between the Delaware and Susquehanna, and between the Ohio and Lake Erie, a general system will exist, more equal in its operation upon the several sections of the state, and better calculated to effect the great purposes of internal improvement than any other that can possibly be devised.

The great outline being once accomplished, and its practical results fairly tested, minor works for the accommodation of particular districts may advantageously be introduced, as accessaries to the general plan; such as a communication between the Susquehanna and Potomac, and between the Juniata route and the proposed Chesapeake and Ohio Canal, and some others of a similar character. At some future day the increase of produce and population upon the west branch of the Susquehanna, above the mouth of Bald Eagle, may justify the extension of a canal upon that river, and a connection with the western waters by means of a portage.

It is with great deference suggested, as the opinion of the board, that the future legislation of the commonwealth, with reference to this subject, should be based upon such a plan as they have ventured to propose, and that such sums of money as the legislature may appropriate from year to year, should be divided in fair proportions among the several improvements which constitute the system. By extending the canals already under contract up the Conemaugh, Juniata and Susquehanna, respectively, such distances in each year as the appropriations shall justify, economy in the cost of superintendance will be most effectually regarded, and each part as completed, will be soonest brought into profitable operation.

If the views which the board unanimously entertain on this important subject, shall meet the approbation of the legislature, they take the liberty further to suggest, that the system be commenced as early as possible in the ensuing year, by placing under contract lines of canal, from the mouth of Juniata to Northumberland, 37 miles; from the same point up the Juniata to Mifflin 34 miles; and from the head of the Kiskeminetas feeder to Blairsville, 33 miles. It is estimated that an ap-

propriation of 1,000,000, for this year, with the balance remaining from that of last year, will enable the board to complete the two divisions already located, and to carry on the three proposed lines, with the utmost activity during that part of the season which shall remain, after placing them under contract. A similar appropriation for five successive years, is completely within the resources of the government, and will accomplish that portion of the great system for the improvement of the state, which the information of the board enables them at this time positively to recommend.

It is the wish of the board, during the next season, to complete the examinations required by the act of 11th April, 1825. Surveys will be made by competent engineers. of the routes from Philadelphia, through Chester and Lancaster counties, to the Susquehanna; from the Ohio and Allegheny to lake Erie; and through Bedford county, to connect the route of the proposed Chesapeake and Ohio canal, with the Juniata route. Should the decision of the legislature upon the plan now suggested, render it necessary, they propose also to locate with the utmost care, the line of a portage over the Allegheny mountain, between the Juniata and Conemaugh.

There is one line of communication within the borders of Pennsylvania, to which much importance is deservedly attached, but which under the existing law, the board have no power to examine. They allude to a route from the tide water of the Delaware, up the valley of that stream. Its bearing upon the prosperity of our commercial capital, and its tendency to accommodate a rich section of country, far removed from the scene of other projected improvements, have given it considerable interest in the view of the board. They therefore, respectfully asked for authority to make such an examination during the approaching season. The means already at their disposal, are deemed amply sufficient for this, in addition to the other surveys named.

By the act of 25th February, 1826, the canal commissioners are directed "to construct a navigable feeder of a canal from French creek to the summit level, at Conneaut lake, as soon as they shall deem it expedient and practicable." The entire practicability of this work, is demonstrated by the report of major Douglass, heretofore referred to. But whether its execution shall be immediately undertaken, or shall await the determination of a line between the Allegheny and lake Erie, is a question of expediency which in their opinion the legislature should decide. It may be remarked, that the construction of a part of the feeder during the next season, might be so combined with the Ohio and Erie survey, as that a single engineer would attend to both, and that $100,000 applicable to this object, is quite as much as could be profitably employed before the next session of the legislature.

One or two subjects of minor importance remain to be disposed of.

It will be remembered, that the board in their report of December last, referred to the probable necessity of raising the upper level of the eastern division of the Pennsylvania canal, and if so changing the location and the mode of drawing water from the river, as to correspond with the original plan proposed by Mr. Strickland. Within a few days past, this question has been referred to the four engineers in the service of the board, in pursuance of whose unanimous report, (hereto annexed) the upper level has been continued to the upper reef of Foster's falls, near Clark's ferry, and the alteration approved by his Excellency, the Governor. At the last mentioned point, a dam of three feet high will be erected in the river, so as to insure an abundant supply of water at all seasons, and enable the trade of the Juniata to reach the entrance of the canal with greater facility. An opening will be left in the dam, in a right line with the channel, for the passage of river craft, and guarded in such a way, as rather to improve than impair the natural navigation of the river.

By the 6th section of the act of 10th April, 1826, the commissioners are required, "during the present season, to call upon and receive, or cause to be called upon and received, from all persons, as far as can conveniently be done, who are owners of land along and near the proposed lines of communication between the eastern and western waters, acquittances or releases from any claim to damages, in case the said line of communication should pass through their lands, and for materials which may be taken to carry on the work."

At an early period after the passage of the law, a committee of two members of the board was appointed to superintend its execution, with authority to employ a suitable person, whose business it should be, to pass over both contemplated routes, and call upon the owners of land contiguous thereto. The committee, on the same day, engaged an individual, who has since passed on foot along the whole northern route, and back to Harrisburg, by the Conemaugh and Juniata. The result of his labors, although there is no reason to doubt his industry or fidelity, has fallen far short of what was probably expected by the Legislature when they passed the law. There seems to have existed among the owners of valuable property, a strong, and perhaps not unreasonable reluctance to waive their rights, without first ascertaining the precise degree in which their interests would be affected by the contemplated improvements The expense incurred in this undertaking was $293 25, viz: $274 50, for 183 days services, and $18 75, for contingent charges. A report of the committee entrusted with this subject, and of the person employed by them, is hereto annexed.

The experience of the board during the past season, has shown, that in many cases where damages are claimed for small portions of private property, which are, in a great measure, destroyed by the public works, it would be cheaper to

purchase the land at a reasonable rate, than to pay the amount of such an assessment as would probably be made. The cases referred to in the last report of the board, are precisely of this character. The power to purchase, on behalf of the state, cannot be implied from the present act of Assembly; nor could it be available without further authority to sell the remainder not occupied by the canal, and to give the vendee a legal title. On both these heads, therefore, the aid of the Legislature is respectfully asked.

The existing laws, which regulate the board and define its powers, speak only of canals, and are thought to exclude the idea of a slack water navigation. That the former should be the prevailing mode of improvement, the board entertain no doubt: but there are portions of all our river vallies so closely confined by steep and difficult banks, that the latter might be substituted at a great saving of expense, and without injuring the advantages of the work. Some discretionary power, in such circumstances, should, therefore, be given to the commissioners, under proper restrictions.

The board have not ventured to recommend the construction of extensive works, without a well founded conviction that they must yield a revenue to the commonwealth completely adequate to the original cost. A special committee have devoted their attention to this interesting subject, and have availed themselves of every source of information that could be relied on. The materials collected from the most intelligent and best informed individuals in the several sections of the state, partly in conversation and partly in the form of written answers to questions proposed, are too various and extensive to be offered in detail. A few general results will therefore be stated, to justify the opinion already expressed

It is estimated that 63,396 tons of vegetable and mineral products of the value of $1,690,000, which must be carried on a canal when made, now pass annually down the North Branch; and that 29,907 tons of such articles, worth $1,052,000, pass down the West Branch in the same time; making the total present trade of the Susquehanna above the mouth of the Juniata, which a canal must take, 92,302 tons a year, and its value $2,743,000. The trade of the same kind down the Juniata, is at least 33,000 tons, of the value of $1,188,000; so that the total of commerce which passes the mouth of the Juniata by water, from the north and west, of a kind to be carried on a canal in preference to the river, is 125,303 tons, of the value of 3,931,000 dollars.

It is estimated, moreover, that 573,160 bushels of salt, and 17,440 tons of iron, arrive annually at Pittsburg, by land and water, from districts bordering on the Conemaugh and Kiskeminetas, making the whole present tonnage on these two articles, 31,769. The transportation of goods by land, from Philadelphia and Baltimore to Pittsburg, amounts to 9,300 tons a year, for which 465,000 dollars is paid; and the return transportation to these places is 5,300 tons, for which 132,500 dollars is paid, at the pre-

sent reduced rates. The aggregate of this land transportation on 14,600 tons, may be added to the tonnage already stated as existing on the Juniata and Kiskeminetas. Nor does this estimate include the flour, whiskey and other produce which arrives at Pittsburg by land, and is carried by land from the neighborhood of the Juniata, which items would greatly swell the amount.

It is believed that the commerce already existing, would be an object sufficient to justify the undertakings proposed. But when the immense quantity of mineral and agricultural products, comparatively worthless at present, which a safe communication with a steady market, would raise at once to their proper value, is taken into the account, the aggregate as above stated sinks into insignificance. The anthracite coal of Wyoming and the adjoining valleys, and the bituminous coal of the Towanda, will pass down the North Branch in quantities exceeding its whole present trade, and only limited by the demand which all the markets of the union can create. The iron and coal trade of the West Branch, and of the Juniata, and the supplies of salt, coal and iron from the Kiskeminetas, may be expected to increase in the same incalculable ratio, while immense quantities of the products of agriculture which sink under the cost of a precarious transportation, will find their way by all these avenues to a profitable market In addition, it must be remembered that the return tonnage on the canal, which enters but partially into the foregoing calculations, will afford to the state a handsome revenue.

One view of this subject remains to be suggested, which is entitled to great weight with the intelligent and patriotic. The state of Pennsylvania has advantages of the highest grade, and sources of wealth almost without a limit. But while the bounties of nature have flowed so copiously, the great principle in the order of Providence, which calls for human effort, in exact proportion to natural capability, has been indelibly written on her mountains and her torrents. For want of such exertion, the prosperity of Pennsylvania has comparatively languished, while a more enterprising neighbor has advanced with unparalelled rapidity. Without artificial navigation, the citizen of Pennsylvania has been limited in his commerce, to the course of a stream, or has found in his mountains an impassable barrier to a profitable market. Hence each section of country has had a different outlet, most of them beyond the borders of the state; hence that wealth has been dissipated among strangers, which ought to be accumulated in emporiums of our own; and worse perhaps than all, a disunion of interest and of feeling has been created, than which nothing can be imagined more dangerous or enfeebling.

The system proposed, is deemed adequate to the remedy of all these evils. It will give full scope to our natural resources, and to our most valuable industry an increased security. It will unite all sections of the state by the bond of common interests and mutual dependence. It will ensure to our own citizens the pro-

fits of our industry, and accumulate that wealth which industry and enterprise, combined with natural and artificial advantages, cannot fail to produce.

All which is respectfully submitted,

By order of the board.

WM. DARLINGTON, *Pres't.*

JOS. M'ILVAINE, *Sec'ry.*

February 6th 1827.

No. 1.

Report on the Susquehanna and Potomac route, by John Mitchell, Esq.

To the Board of Pennsylvania Canal Commissioners.

GENTLEMEN,

In compliance with your letter of instructions, dated the 17th June last, I immediately proceeded to the duties assigned me, and commenced my leveling as marked on a button wood tree on the north side of the Conodoguinet creek, at its junction with the Susquehanna, in the county of Cumberland. I continued my level up the creek, following the different windings of the channel, the distance of three miles and ninety-eight perches to a marked swamp white oak, making an ascent of 16.08. On the south side of the creek, the banks are high, and afford no bottom which does not overflow by high water. On the north side, for a short distance above the mouth of the creek, the ground ascends gradually from the creek; the high banks then put in, the same as on the south side. The slate and limestone soil is divided by this stream, the former being on the north and the latter on the south side. Continued my level a distance of five miles and seventy-nine perches, to a marked cherry-tree, near the dwelling house of a Mr. Orr. Ascent, 16.02—the banks, bottoms, &c. the same as before described. Continued a distance of four miles and two hundred and forty perches to Roop's mill dam. Ascent 17.63—banks steep and high—bottoms as before. Continued a distance of nine miles and thirty-eight perches to Fisher's mill. Ascent 29.18—in this distance three limestone bars put across the creek from the south to the north side, the banks and bottoms as before. Continued a distance of five miles and ten perches to Hoover's mill dam. Ascent, 12.30—in this distance, one limestone bar extends across to the north side of the creek; the banks continue steep and high, but occasionally the bottoms are wider. Continued a distance of four miles and one hundred and sixteen perches to the mouth of Letart spring. Ascent 6.95—one limestone bar crosses the creek, banks not generally so high as before, and bottoms increasing in breadth. Continued a distance

of four miles and one hundred and twenty-ight perches to the mouth of the cove, at Blain's mill dam. Ascent, 14.55—bottoms wider than before, and banks not so high. Continued a distance of six miles and two hundred and fifty-six perches, to Haye's mill dam. Ascent, 21.66—in this distance, the banks are alternately high and low; a short distance below this mill, the slate land commences on the south side. Continued a distance of four miles, thirty-eight perches, to Dillar's mill dam. Ascent, 13.05—limestone again on the south side, and a bar of thirty perches in breadth crosses to the north side, bottoms and hills as before. Continued a distance of four miles and two hundred and eighty perches to the point of an island near and below judge Graham's. Ascent, 13.04, a part of this distance slate banks on both sides, bottoms larger than before. Continued a distance of ten miles and forty-three perches to Mrs. Thompson's. Ascent, 41.57; in this distance there are alternately high banks on one side, and bottom on the other; slate land on both sides the creek. Continued a distance of eleven miles and thirteen perches to the mouth of Herron's branch.—Ascent, 65.35; slate banks on both sides, and occasionally extending to the water edge with a considerable elevation; proceeded up Herron's branch, a distance of four miles and forty-six perches to a post marked near Mr. Koiner's house, at what is called Culbertson's row. Ascent 53.86; in this distance the slate soil terminates, and the lime stone commences on both sides the branch. Continued my level to the head of the springs, a distance of 190 perches. Ascent 12.27. Here are two large and standing limestone springs, the place called Culbertson's row. Returned to the point at Koiner's, and pursued a natural water course, but now dry, a distance of two miles and 124 perches, to the summit level, near Green village, as marked on my draft. Ascent, 43.73; in this distance the limestone rocks appear to approach near to the surface of the ground, and in many places have the appearance of being washed by a stream of water, and are entirely bare and exposed to view on the surface of the ground. After exploring the country in search of the lowest ground, and being accompanied by a number of gentlemen from Chamberburg, I returned to the summit and carried two different levels to the Conocogeauge creek, both of which terminated at the same point, say at Weaver's mill, being the height of my summit level. One of those surveys only, is represented on the draft, and marked as a feeder, the length of which will be not more than two miles. Descent from the summit by the first survey, which is not represented on the draft, and which terminated in the head run of Hettick's mill, but a considerable distance below his dam, is 17.22. I would approve of building a dam of six feet in height, across the creek, one hundred and eleven perchess above Chambers' mill, from which the water can be conveyed to the summit, and will not only give an increase of water by the addition of three springs, one of which is large, but also avoid a very difficult part of the construction of the feeder, which arises from the

very steep and rugged limestone rocks, projecting to the water edge, above the proposed dam. Beginning again at the summit, I continued my level towards Chambersburg, on the ground on which the canal might be made, and following a natural channel leading to the creek, which is laid down in my draft.—Distance to the creek, one mile and eighty-two perches; descent 34.70; the soil is limestone, but appears not to approach so near the surface of the ground as on the ascending side of the summit. Continued down and along the creek, a distance of one mile and thirty-four perches to where the bridge on the turnpike road crosses the same. Here our course terminated at the heighth of the west end of the bridge, above the water, making to this point, a descent of 5.33; there are bottoms on one or the other side of the creek, for the last distance My course from this bridge, was along the turnpike, a distance of two miles and one hundred and forty perches to the surface of the water in the Conocogeague creek, in the town of Chambersburg. Descent, 40.07; the creek for this distance on my right, the soil limestone on the south side, and slate in part on the north. From this point I commenced levelling to connect my survey with the waters of the Monocacy and the Conewaga creeks, and pursued the turnpike road leading to Gettysburg; finding the heighth of the south mountain on the said road 823.39 above the creek at Chambersburg.

Here I departed from my instructions, believing it a useless expenditure of time and money, to search for the lowest summit between the Conocogeague and Conewaga creeks; they both rising in the South mountain, and nearly at the elevation above stated from Chambersburg. Continued a distance of twenty-four miles and one hundred and thirty-four perches, being the distance from Chambersburg to a marked thorn, at Rock creek, east of Gettysburg, making that point at Rock creek, 195.35 lower than the summit at Green village, and 115.25 lower than the creek at Chambersburg. From here I proceeded up Rock creek, to the summit marked on the draft the lowest summit, to connect with the Conewaga—distance seven miles one hundred and forty-two perches—ascent 80.20 above the thorn at Rock creek, near Gettysburg; making this summit 115.15 lower than the summit at Green village. This country, so far as I have been through it, since crossing the South mountain, is entirely a slate soil, and in many places a red slate rock, approaching within from 18 to 24 inches of the surface of the ground. This discovery was made principally along the small streams of water. I carried the level to five different summits, as represented on the draft. I then carried the level to a point on the Conewaga creek, sufficiently high to bring the water to the summit—this point designated on the draft by a white oak. To this point all the water destined for the summit is brought, and from there passes in one feeder, as represented on the draft. The water for this summit is taken from the Conewaga, Opossum and Marsh creeks; the

different measurements are stated in note book, No. 4. From a particular inquiry among the people on these waters, I am inclined to believe that the streams become much lower than when I measured them; the Conewaga more so than either of the others. I carried my level towards the south branch of Marsh creek, with a view of bringing it in: but in this I failed. The ground is such as cannot be passed to a height necessary to throw the water into the Marsh creek feeder. From here I returned to the Roxbury branch of the Conodoguinet, and levelled up to the B. O. as marked on the draft: and the height of the summit; the feeder from this point, will be little less than nine miles in length; the ground part slate and part limestone. The water of this stream was measured above the forge, as marked on the draft, and was a little swollen by rain, which fell the evening before; it is, however, said to be a standing stream.

Here my explorations ceased, and with my party I returned home. For further information and particulars, I refer you to my note books, four in number; they are the original notes and remarks, taken on the ground. I have, so far as was consistent with my duty, conformed to the wishes of the people in the counties which I passed through, in making the explorations suggested by the most intelligent of them. The public property which remained in my hands from the last year, has been deposited in the arsenal at Harrisburg—the receipt now delivered you. The levelling instrument is now in the possession of Mr. Rawle, at Harrisburg. The only public property, now remaining in my possession, is the small water level, which will be delivered on your order.

J. MITCHELL.

December 8, 1826.

N. B. I find I have neglected to state my levelling up the west branch of Marsh creek. It will be found represented on the draft, as terminating at an elm, on the creek, and at the place where the feeder commences.

J. M.

No. 2.

Report on the French creek feeder, by Major D. B. Douglass.

To the Board of Canal Commissioners of the state of Pennsylvania.

GENTLEMEN,—

Having completed my surveys and examinations on the route of the "Feeder from French creek to the summit level at Conneaut lake," and the various calculations connected therewith, agreeably to the instructions of the board, I have the honour to report as follows:

The first object to which the attention of the engineer was necessarily directed, as being preliminary to any local determination of the feeder, was the *provisional* location and graduation of the "summit level" itself. For this purpose, having organized a surveying party under Mr. E. Felton, of Meadville, and a levelling party under my own immediate direction, I proceeded on the day but one following the departure of the board from Meadville, to the summit ridge between Conneaut lake and the Big Conneaut of Lake Erie. This ridge consists of a range of moderately elevated and undulating upland, varying in height from about thirty to ninety or one hundred feet above Conneaut lake—lowest towards the west. On its southern slope, it gives rise to several small tributaries of Conneaut lake, which, interlocking in some instances with corresponding tributaries of the Big Conneaut, furnish routes more or less eligible for the communication between the two waters. Among these, the route which has attracted the principal share of public attention, hitherto, is that which passes from the lake up to the eastern branch of Beaver Dam run; another has been suggested more *westerly* than this, and another more *easterly*, by the valley of Prairie run, (Bright's mill stream.)

The more westerly route I did not examine, as from the best information it appeared evident that its relation to the feeder would be very nearly the same as that by Beaver Dam run. As to the route by Prairie run, although manifestly higher at the summit than the Beaver Dam route, it appeared also much more direct; and particularly when taken in connection with a supposable route up the eastern shore of Conneaut lake, and I concluded, therefore, to run a line of levels upon it. This line commences at the mouth of the *inlet*, (so called,) and was run nearly north by the valley of Prairie run,—crossing the public road a little west of Brown's house, to the dividing ridge, and so on to a water of the Big Conneaut, as exhibited on the map. An offset line was also run from a point in Brown's meadow, to the highest part of the Beaver Dam route, and compass lines on both, from the lake, across the height of land, and down the respective branches of the Big Conneaut, till they met. Similar lines run on the two shores of Conneaut lake, completed the examinations with respect to the summit level, and the party was then withdrawn to the foot of the lake, to commence the survey of the feeder. The questions which present themselves with reference to the route and level of the summit line, and which were to be decided by the surveys and measurements just enumerated, are the following:—1st. Whether that line should cross the dividing ridge by the valley of Prairie run, or by one of the branches of Beaver Dam run? 2d. Whether it should pass up the eastern or western shore of Conneaut lake? 3d. Whether it should be graduated to the present level of the lake, or made to unite with it at some higher level? or finally, whether it might not advantageously be graduated at a much higher level, and made independent of the lake?

The hope of obtaining an advantageous location by the Prairie run route, was founded, as already mentioned, upon the idea that its superiority in point of distance, was more than sufficient to counterbalance the disadvantage of a greater depth of cutting. Upon trying it with the level, however, the difference of cutting in favor of the Beaver Dam summit was found to be much more considerable than I had at first imagined, amounting (as may be seen by the comparison on the 3d page of the level book,) to about twenty-six feet; and requiring, in the case of a graduation at the present level of Conneaut lake, a deep cutting, of nearly 60 feet on the Prairie summit. So great a difference, of course, excluded all *probability* of a location by this route, connected with a graduation at or near the present level of the lake, there barely remained the *possibility* of using it with advantage, in connection with a line located along the uplands of the eastern shore, at some distance *above* the lake, and measurements were accordingly directed with reference to that point; by a comparison, however, of these measurements, it appears that even in this case, the preference must be yielded to the western route. The distance from the head of the lake, for instance, to the junction of the two lines on the Big Conneaut, measures, by the Beaver Dam summit, 1398 perches, and by the Prairie summit 1218, and as the difference of these lengths is evidently too small to compensate for the difference of deep cutting above mentioned, the route by the latter must be considered, in every point of view, as wholly inferior to the former.

The second question with relation to the summit level, involves a comparison of the advantages and disadvantages of the two shores of the Conneaut lake. The two routes following those shores respectively, diverge from each other at some little distance south of the summit ridge. The one on the left crossing over from the valley of the Beaver Dam to that of the inlet, passes round the head of the lake, and down its *eastern* shore to the south-eastern extremity; where it leaves the lake and commences its course along the lateral slope of the *outlet* valley. The other continuing down the direction of Beaver Dam run, to its mouth; takes, there, the *western* shore and follows it to the outlet, thence, passing down the latter, and gradually changing to a more easterly direction, it rejoins the eastern route at a prominent point of upland, about two thirds of a mile below the lake.

In a comparison of the entire lengths of these routes, it appears that they differ but little; that on the eastern shore being 1655 perches, while that on the western measures 1550, the difference of 105 perches being in favour of the western route. But for the sake of comparing them more minutely and more accurately, I divide them each into three sections: the first extending from the upper point of divergency to the lake, the second from the termination of the first to the foot of the lake, and the third from the foot of the lake to the point of re-union as above specified.

The first section by the eastern route is 505 perches in length; by the western, 600. I observe, however, that the eastern, by crossing from the valley of Beaver Dam run to that of the inlet, has necessarily a greater proportion of deep cutting than the western, which descends wholly by the former. The precise difference I did not determine; but I am persuaded, from my general knowledge of the ground, that the mean sectional area on the eastern line is at least one half greater than that of the west; multiplying this relation by that of the length, we find the cubic quantity of the eastern to that of the western section, in the ratio of about 5 to 4. and without taking into consideration, therefore, the difference of expense, in excavating, bulk for bulk, at different depths, we infer, with respect to the first section, a difference of at least one fourth in favor of the latter.

The second section of the eastern route along the margin of the lake, measures 925 perches; and the corresponding portion of the western route 700 perches. This difference of length would at once suggest a preference of the western route; but it may not be improper to verify that preference by considerations drawn from the topographical features of the two shores. The waters of Conneaut lake are no where deep, and along its shores particularly shallow, so that in the event of the canal being graduated to the present level of the lake, it would every where require excavation below water, to form the navigable channel. Above water, the eastern shore is generally bold, while that on the west is, for the most part, skirted with a margin of low wet ground. The necessity of cutting through this, upon the supposition just mentioned, would render the western excavation somewhat more expensive, perch for perch, than the eastern; but taking its shorter distance into consideration, it is decidedly the most economical. Upon the supposition of a summit level produced by embanking the lake to the height of five or six feet above its present level, the mean sectional area of the construction on the east side will be about 19 square yards; that on the west, 16; and the entire labor of the latter, taking the lengths into account, $\frac{5}{6}$ that of the former. This calculation supposes that the channel way of the canal is defended on the side of the lake by a breakwater embankment. But as wind storms of such a character as would interrupt the navigation of the lake, are said to be of unfrequent occurrence in that vicinity, it is possible that this protection may not be required. Tornados have sometimes occurred from the south-west, and, in the winter, storms attended with heavy winds, from the south-west. The former would equally disturb the navigation of the canal as of the lake, while the latter, occurring during the winter, may be said to interrupt neither. In general, however, the winds which would be most likely to hinder the navigation are from the western quarter; and hence an additional reason for locating the canal on that side of the lake. We conclude, therefore, upon every supposition of a level graduated *near* the present level of the lake, the western shore is preferable. Upon the hypothesis only of a more elevated and independent lo-

cation, the topography of the eastern shore would give it the preference; but the discussion of that alternative will more properly be introduced hereafter.

The sections No. 3, of the two routes now under comparison, measure by the eastern route 225 perches, and by the western, 250 respectively; and as the ground over which they run is nearly the same for both, they may be compared with sufficient accuracy by the simple ratios of these lengths. This gives a slight difference in favor of the eastern line; but as the differences already obtained upon both the preceding sections are much more considerable on the side of the western route, the preference, upon the whole, is unquestionably in *its* favor.

The third question with relation to the summit level, is its graduation in height.

The principal advantage to be gained by adopting a more elevated level than the present one of Conneaut lake, is in avoiding depth of cutting on the summit ridge. According to the experience of practical men, the expense of these cuttings, when the depth exceeds an ordinary limit, is very inadequately represented by any simple ratio of that depth; and a few moments attention to the subject will enable us to infer the same truth upon mathematical principles. The total cost of a deep cutting is compounded of the cost per cubic yard, and the product of the length, depth and mean breadth of the excavation. But each of these factors is in some measure dependent upon the *depth*, and varies with it; and the cost, therefore, of an excavation answering to an increased depth, must be the product of that depth by an increased length, an increased breadth, and increased cost per cubic yard; on all these accounts, therefore, the increment of total cost must be much more rapid than the simple increment of the depth. It would not be difficult, if it would render the subject any more perspicuous, to reduce these factors to analytical formulæ, and to combine them in the expression of a general result, corresponding to every variety of case; but it is not necessary for the present purpose. It will be sufficient for illustrating the general remark with which the subject was introduced, to present the result of a calculation upon two or three particular hypotheses—as, for instance, if the cost of cutting through a ridge similar to the dividing ridge of the Conneaut, at the depth of ten feet, be expressed by 1, that of a *twenty* feet cutting, in the same case, would be 4, that of a *thirty* feet cutting, 12, and that of a forty feet cutting, £6; and it will readily be inferred that a saving of even a few feet, in a maximum cutting of 30 feet and upwards, is a matter of some consideration.

There are two ways of raising the summit level above the present level of the lake. First, by damming and banking in the lake itself to a higher level; and secondly, by locating the canal along the uplands of the eastern shore, independently of the lake.

The project of embanking the lake has generally been contemplated with a view to the formation of a reservoir for the supply of the canal, and it is possible that by the diminution of the streams

in consequence of the progressive improvement of the country, such an expedient may be required at some future period on this account, but at present its importance in the point of view just mentioned, must be regarded as greatly superior. The expense of constructing the canal upon the supposition of a level elevated by a dam to the height of five or six feet above the present surface of the lake, would scarcely exceed that of excavating to the present level. The line passing along between the marsh and upland of the western shore, would be formed in the case of an enclosed channel by embanking, a mean profile of about 16 square yards, as already stated, which does not greatly differ from the excavation on the lower level, the dam and embankment only at the foot of the lake requiring an additional expense.

But if the plan of construction without an enclosure, on the side of the lake, should be adopted, the expense would be greatly diminished. In raising the level much more than six feet, however, the same relative facilities of construction would not exist; the general elevation of the country on the western shore being so slight as to render necessary, in that case, a much larger proportion of embankment. For this reason I propose, as a convenient medium, that the top water-line upon this plan of construction, be adopted at an habitual elevation of 8 feet above the present level of the lake, and that the works be also graduated so as to admit of an *additional* elevation of two feet, if occasion should require it; this will reduce the labor and expense of thorough cutting at the summit ridge, in the proportion of about one half. The second mode of elevating the summit level, to which I have alluded, is by carrying the canal along the uplands of the eastern shore, independently of the lake.

The advantage of this arrangement would be, that it enables us to reduce the expense of deep cutting, to almost any desirable limit. By adjusting the line, for example, at the height of twenty feet above the surface of the lake, I find that the expense of the deep cutting would be reduced to about one-fourth that of excavating, down to the eight feet level, and to less than one-eighth that of a thorough cut. So considerable an advantage should lead us at once to the adoption of this plan, if it did not appear to be attended, also, with several important disadvantages; and which, although developed in the subsequent parts of the survey, it will be more proper to notice in this place, viz.

1. The line of the feeder, located according to this plan, in comparison with that at the eight feet elevation, will be considerably *increased in length*; as, for instance, it will be more circuitous in its passage round the head of Conneaut Lake, and its whole course being located higher on the slope of the French creek and Conneaut valleys, will be more affected by the transverse irregularities of the ground, than at the lower level; and, finally, having to derive the waters of French creek from a higher point, it would require a considerable addition of length at the place of commencement. From all which causes it is estimated, that the

increase of length, arising by an increase of twelve feet, in the elevation of the line, would not greatly fall short of *four* miles.

2. Several additional embankments would be necessary; and all those contemplated on the lower level, such as that for the crossing of Watson's run, and the runs on French creek, or for the crossing of French creek itself, in case the east rise is taken, would be enormously increased.

3. An additional lockage of 24 feet will be required in the ascent and descent of the main canal.

4. The supply of water for all the purposes of the canal, would have to be derived solely from the reservoir of French creek; and, although I consider the volume of that stream, as amply sufficient *at present*, for this purpose, I am not prepared to say whether the effect of opening and improving the country, may not, at some *future period*, render its supply inadequate.

The mature consideration of these objections induced me to look less favourably upon this plan, at the conclusion of my survey than I had done at the commencement. But I am still of the opinion, that in point of mere first cost, if other considerations did not intervene, a cheaper canal might be constructed by this arrangement than by passing through the lake. The *accurate* determination of the problem would require a more particular as well as a more comprehensive survey with reference to that point, than it was in my power, in so short a space of time, to execute; but considering it, from the general result of my observations, as improbable that the saving in this respect would compensate for the public inconvenience of a longer line, and greater lockage, I have not hesitated, in adopting the graduation at the eight feet elevation, in common with the lake, in preference to an independent location at a higher level. Should the board, however, from what has been said, be inclined to order a further examination of this question, the present survey would still furnish the necessary data for the estimation of the line from Conneaut lake downwards; as the ground on both sides of my experimental line was embraced by transverse levels to a sufficient distance for that purpose.

I proceed now to explain the operations on the line of the feeder, properly so called, from the foot of Conneaut lake, to the position of the dam on French creek.

The outlet of Conneaut lake meanders from the lake, to its junction with French creek, through a strip of deep morass, called Conneaut marsh, having slopes of tolerably elevated upland on the right and left. It is along that, on the left or north-east side of the marsh, that the route of the feeder has generally been contemplated, and on this ground, therefore, commencing at the south-eastern extremity of the lake, the experimental line was traced. Its height above the surface of the lake was taken, at an average of about 14 feet, as affording the most advantageous command of the lateral ground, and wherever there was any change in the lateral declivity of the ground, cross levels were run to the utmost extent of the probable location. For the first

3 miles the operation was attended with considerable difficulty and delay, in consequence of the intricacy of the woods, and the numerous windfalls of heavy pine timber; but beyond that distance the ground became more practicable, and continued, with very little exception, alternating between improved land and open woods, for the remainder of the distance to French creek. The ground on the whole of this distance is remarkably favorable for canalling, the soil being generally of the easiest kind for excavation, and of an excellent quality for holding water, and the ground, by its gentle and almost uniform lateral declivity, affording the most convenient site for the construction as well as for the location of the canal. The only point which can bear a particular exception to this remark, is the crossing at Watson's run, where a considerable culvert and two embankments of moderate elevation, and about 250 yards total length, will be necessary. The slight embankments which will be required in a few other instances, and the extra cutting, which may be necessary in two or three places, for connecting the allignment of the canal, are too inconsiderable to be particularised in this place; and the whole twelve miles, therefore, from Conneaut lake to French creek, with the small exception just mentioned, may be regarded as particularly favored by the topography of the ground.

On the arrival of the survey upon the western margin of French creek, the question presented itself, whether its continuation should be carried up the eastern or western shore of that stream. In all the surveys and examinations made by the authority of the United States, the western shore had been uniformly contemplated as affording the most eligible route; but as some degree of importance had been attached by the people of Meadville to the eastern side, and as the objects of the present survey were presumed to have a more particular regard to local accommodation, than that of the general government could have, it became necessary to bring the advantages and disadvantages of the eastern, into a fair comparison with those of the western shore. It was expected also, at that time, that the results of the United States' surveys on the western shore, would have been communicated in answer to the application of the board, and as the time allotted to this survey was extremely short, it was hoped that both terms of the comparison would thus be placed within the reach of the engineer, by the mere examination of the eastern shore; I did not hesitate, therefore, in choosing that shore for the continuation of the line. After due examination of the ground for some distance up the creek, the point of crossing was selected at a few hundred yards above the dwelling-house of Edward Herrington. The creek in that place approaches a very high bank on its eastern shore, while the bottom on the west is reduced to about 200 yards in width, by a prominent point of upland running out from the general range of hills on that side. No other point between the mouth of the outlet and Meadville, appears to pre-

sent equal advantages for crossing, if the eastern shore should be taken. Four days operations, including the crossing of French creek, carried the level line to the village of Meadville, and a fifth enabled me to close it at Bemiss' mill, two miles above. The measurement, and a brief personal examination of Major Kearney's line, on the western shore, then terminated the surveys relative to the line of the feeder.

It appears from the results of these surveys, that the location of the line on either side of French creek is attended with somewhat greater difficulty than that down the Conneaut valley. On the eastern side, immediately on crossing the creek, the steepness of the lateral declivity presents some inconvenience for a short distance, after which we come to a bold bank of the creek, resting upon a substratum of blue clay, and exposed to slips. Generally, the ground for the first mile and a half after crossing the creek is broken and irregular, and at one place ,near Shaw's house, will require a short deep cutting of about sixteen feet, to avoid the circuit of a projecting headland. A mile and a half of favourable ground then occurs, from Wentworth's farm, inclusive, except a slight extra cutting and embankment, near William Compton's. Beyond this, about a quarter of a mile of steep and irregular *second bank*, brings us upon more favourable ground for about three fourths of a mile, passing Smith's and Bemis' farms. The lateral slope then assumes more distinctly the character of a steep and sometimes precipitous second bank, along the face of which the line of the feeder must pass, occupying nearly the line of the old Franklin road and the turnpike, for a mile and a half, which brings us to the flat level ground south of the village of Meadville. The location is then highly favourable to the entrance of the village, which for the present is assumed as crossing Arch street near the intersection of Plumb alley; thence passing to the intersection of Chesnut and Second streets, and thence either through the latter, or in a more direct line, to the S. W. corner of M'Gaw's mill, where it strikes the bank of French creek, and leaves the village with a deep side cutting of about 70 perches in length; the remaining distance to Bemis' mill dam, the greater part, requires a location at the foot or along the face of a steep second bank, some part of which would have a small proportion of the excavation in a species of loose slaty free stone. Towards the dam, however, the elevation of the bottom land on the left becomes such with respect to the probable graduation of the feeder as to afford an advantageous location by leaving the bank and gradually approaching the creek.

I have assumed Bemis' dam as the scite of the feeder dam in the case of a location on the *eastern* as well as on the western shore; but if the eastern side should eventually be taken, it would deserve further inquiry whether a dam at some higher point would not be preferable. On the west side, the boldness of the shore, above Bemis' determines the question in favor of that position.

The general character of the topography on the western side of French creek, is much more bold than that on the east, a considerable proportion of its valley, from the Conneaut outlet to Bemis' mill, being bounded on that side by very high and steep hills. From the point north of Herrington's house, where the two lines separate, the first two miles present a surface of broken and irregular ground; and particularly the first mile must be regarded as unfavorable, on account of the extra cuttings which will be required in one or two instances. The lateral declivity is also considerable in some places, though not so great as to require any very extraordinary expense on that account: but beyond this distance, it increases to the extent of 25°, 30°, and even 35°; and continues for about 1000 yards so great as to require a considerable height of wall, on both sides, for the support of the excavation and embankment. The ground here assumes a more favorable character, to the crossing of Wilson's run, where an embankment of about three hundred and fifty yards in length, will be required. Immediately after leaving the valley of Wilson's run, the line again takes the face of the hill, with a sideling declivity of from 30 to 40 degrees, and continues upon it, without any great variation from these limits, for nearly 1200 yards! The slope then becomes somewhat less precipitous, and occasionally varies to a degree sufficiently gentle for construction, without the aid of revetment walls; and after passing, in this way, about six hundred yards further, it becomes altogether favorable, and so continues to the crossing of Vanhorn's run. Here a further embankment of two hundred yards will be necessary, the earth of which will chiefly be furnished by an extra cutting through the hill, behind Vanhorn's house. From this point to Kennedy's bridge, the ground is of the most favorable kind; but from the latter to the crossing of the Cassawaga, about a mile, the line occupies the slope of the upland bank, the declivity of which, however, becomes inconsiderable towards the extremity of this limit. After crossing the Cassawaga, which requires a wide culvert and about 300 yards of embankment, the topography is wholly favorable for the remainder of the distance to Bemis' dam.

Having thus exhibited a general view of the ground on which the feeder must, in any event, be located, as well down the valley of the Conneaut outlet, as on both shores of French creek, it remains, before we proceed to the particulars of its location, to determine the important question of its *declivity*.

It is frequently imagined that the declivity at the bottom of a canal, regulates the velocity and discharge of its water; but a very little attention to the subject will show that this idea is founded upon a false analogy, which the mind is apt to imagine between the channel of a canal and that of a river. If the guard gates, for instance, at the extremities of a long reach of

canal, were kept carefully closed, there could evidently be no discharge; and whatever might be the declivity of the bottom, the water in such a canal must remain perfectly quiescent. If, now, a sluice be opened at *one* extremity of the reach, (the water being kept at a uniform height at the other,) a discharge, corresponding to the capacity of the sluice, is immediately produced; the water in the canal also acquires a velocity in some proportion to the discharge, and the *surface* assumes the declivity to which that velocity is practically due; and here also, as before, the whole operation is independent, except in a very remote sense, of the declivity at bottom. The principal object of solving the problem, (and a very important one in the adjustment of a feeder, where the discharge is great,) is, that, for the convenience of navigation and the safety of the works, the depth of the canal may be *made uniform*. The proper course of inquiry, therefore, in conformity with these views, is as follows:

1st. To ascertain the actual demand at the point where the feed water is to be delivered;

2d. Knowing the transverse section of the feeder, to determine the velocity answering to the required discharge;

3d. To ascertain the superficial declivity to which that velocity is practically due; and

4th To apply the result in graduating the declivity at the bottom.

Firstly. To ascertain the actual demand at the point where the feed water is to be delivered.

The water of a canal is expended, as is well known, in *evaporation, filtration, lockage* and *leakage.* Of these. the evaporation and filtration depend upon the *length* to be supplied, while the lockage and leakage are absolute terms, having no dependence upon the length.

The effect of *evaporation* chiefly takes place during the summer months, when the business of the canal is most active and when its water is most in demand for other purposes; it is therefore to be estimated at its maximum. According to the most accurate observations, this maximum has sometimes exceeded the rains for a month together, at the rate of a *quarter of an inch* in depth, *per diem*, upon the whole surface exposed; but it may be more generally and more justly estimated, at about two-tenths of an inch per diem; or, which is very nearly the same thing, one cubic foot, per minute, on a surface of about 100,000 square feet. This gives a loss from the surface of a canal forty feet wide, at the rate of about two cubic feet per mile, per minute.

The loss from *filtration* depends upon the surface of water in contact with the sides and bottom of the canal, and varies very widely, according to the nature of the soil, and the quality of the construction. On the New York canals it was observed, during the first years of the construction, that the expenditure for evaporation and filtration amounted to upwards of 100 cubic feet per

mile per minute: but as the supply of water is very abundant, it is presumed the canal was not as carefully puddled as it might have been. When this is done, the expense of water attributable to these causes, may be reduced to half that amount; and probably to as little as one-fourth, after a sufficient time has been allowed for the banks to settle. The soil through which the Conneaut feeder is to be excavated, is generally of the most favorable kind for retaining water, and the best of puddle stuff is also every where to be found within a few rods of the line; and as the same may be said of a considerable portion of the line of the main canal, which is to be fed from this summit, we shall be safe in assuming 50 cubic feet per mile per minute as the loss on account of evaporation and filtration. With respect to the length of the canal which will ultimately derive its supplies from this source, it cannot *now* be accurately known; but we may obtain an approximation sufficiently near for our present purpose. It will consist, in the first place, of the whole *northern* descent from the summit ridge to the harbor of Erie. 2dly, of the *southern* descent from the same ridge, to some point where good secondary feeders can be introduced: and 3dly, of the entire feeder. For calculation sake, I assume the whole at 96 miles, (and it will surely not exceed this,) and, at the rate just mentioned, we thus obtain the entire draft of water from the Conneaut feeder, for the supply of evaporation and filtration, equal to 4800 cubic feet per minute, or 80 per second.

Lockage. A canal, on so important a line as that from lake Erie to the navigable head of the Ohio, should, undoubtedly, be calculated for a maximum navigation, as, from the extraordinary progress of improvement in the west, it can be but very few years after its completion, before it will be filled with boats to its utmost capacity. In estimating the quantity of lockage water for such a case, we have first to ascertain the number of boats which may conveniently pass the locks in any given time. For this purpose, it will be most convenient to resolve the time of a complete passage into three periods. 1. The time employed in entering the lock and closing the gates. 2. That consumed in filling or emptying the lock. And 3. The time required for getting under weigh, and clearing to a sufficient distance for another boat to commence entering

When the boats regularly alternate, every drawing-off of the lock, passes a boat down, and every filling-up, raises one; in this case, therefore, the time of each boat occupying the lock is merely the sum of the above three periods. But when a succession of boats takes place, the lock has to be filled and emptied for each boat, so that the time occupied in this case, is the sum of the first and last periods added to twice the second.

The number of boats that may pass in a given time is evidently greater, upon the first supposition than upon the last; but because in that case each boat requires only *half* a lock-full, whereas in the other a complete lock-full is necessary, the quantity of water expended, in the same time, is less. The average of both,

viz. The number of boats and expense of water, will be most correctly estimated by supposing the boats to arrive in convoys of two, which gives an alternation and succession alternately.

By the mean of seventy-four passages on the locks of the New York canal, observed in 1824-5, I find that the average time of entering one of those locks, is *one and a half minutes*; the average time of filling or emptying, reduced to a uniform lift of 10 feet, *three and a half minutes*; and the time of clearing, *one minute and two seconds*. Using these numbers according to the principles just stated, I find that the time of locking, when the boats present themselves alternately, and supposing the locks to be of the same size and capacity, as those of 10 feet lift, on the New York canal, is at the rate of six minutes and two seconds for each boat, and at the rate of nine minutes and thirty two seconds for each boat, when the boats follow each other. If, therefore, the boats were to present themselves *continually*, according to the first supposition, 10 boats nearly would be enabled to pass in an hour, with an expenditure of five locks full of water; but according to the second supposition, $6\frac{4}{9}$ boats only could pass, at an expense of $6\frac{4}{9}$ locks-full; and these will be the extreme limits, both for the number of boats, and for the expenditure of water. Upon the *average* supposition, of the boats presenting themselves in convoys of two, we find the mean time of locking to be 7 minutes and 47 seconds for each boat, and the number of lockages 7 7.10, say 8 per hour; which being multiplied by the mean expense of water for each boat, (viz. $\frac{3}{4}$ of a lock-full) gives for the maximum navigation 6 locks-full per hour: and this, therefore, will be the expenditure in lockage at each end of the summit level.

The *prism*, of *lift* of the 10 feet locks on the New York canal, and as contemplated for that of Pennsylvania, contains 13,500 cubic feet of water; consequently the demand of the Conneaut summit, for all the purposes of lockage will amount to 162,000 cubic feet per hour, or 2700 per minute.

Leakage. Having calculated the supply of lockage water for the most active state of navigation, it is almost superfluous to introduce a separate allowance for *leakage:* If the locks and gates are properly constructed, it is reduced to a very inconsiderable quantity indeed, compared with the expenditure just calculated: but, that every possible contingency may be adequately provided for, I propose an addition of three cubic feet per second for this loss, in addition to those already estimated, which will be sufficient to compensate a loss of 90 cubic feet per minute, at each end of the summit level.

The total demand of the canal, therefore, will stand as follows, viz.

For evaporation and filtration on 96 miles, at 50 cubic feet per mile per minute,	4800
For lockage, at 12 locksfull per hour,	2700
For leakage,	180
Total per minute,	7680 c. f.
Do. per second,	128

The whole of this quantity I propose to draw through the feeder from French creek. A small part might, indeed, be calculated upon from the surplus of Conneaut lake, and from the streams over which the line passes; but I have chosen rather to neglect it, for the following reasons. The surplus of Conneaut lake, according to the guage notes of last summer, amounts to no more than $7\frac{1}{2}$ c.ft. per second; and as the evaporation of the lake will be considerably increased by the enlargement of its surface, and as some extra filtration will also take place at the dam and dykes by which it is to be enclosed, I suppose the whole of its surplus to be employed in the repair of these losses. With respect to the streams over which the line of the feeder passes, they are generally of so inconstant a character, and so highly charged with alluvion in the season of floods, that it will rather be the part of good policy to exclude them wholly from the navigable channel. Finally, the volume of French creek is amply sufficient, *at present*, for the entire supply. This stream was gauged three times during the survey, once at Meadville, below the mouth of the Cassawago, by measuring the transverse section and superficial velocity. This measurement gave a discharge of 157.45 cubic feet per second; but as it was evidently effected by the stoppage of the mills on the up stream, and at the mouth of the Cassawaga, I have generally considered it as less accurate than either of the others. The second was performed at Sample's Ford, about a mile above Meadville, the pond of Bemis' mill, a short distance above, having been previously drawn down as nearly as possible to its natural discharge; no rain had fallen for several weeks, except a few showers the day before, the effect of which had been marked. This measurement gave a total discharge of 160.17 cubic feet per second; and making every allowance for the effect of the recent showers, gives 147.3 as the discharge under all the influence of the drought. The third measurement was performed with great care, and under the most favorable circumstances, at the flume of the head gate of Bemis's Mill. It took place on the same day and under the same circumstances as to *weather*, with the preceding, and after the head of water in the pond had been drawn down during the whole of the preceding night. The result was 190 cubic feet per second, at the time of measurement, and by rejecting two inches from the head, which was verified, as the effect of the showers of the preceeding day, gives 158.9 cubic feet, the discharge affected by the drought. This was as satisfactory a measurement as could have been desired, and as the season of 1826, was an unusually dry one, it is not probable that the water of the creek will often fall much below this limit; we may, therefore, with still greater certainty, calculate upon its capacity, at all times, to afford 128 cubic feet for the purposes of the canal.

The feeder for the conveyance of the water, is to be "a navigable feeder;" and, as the boats which navigate it will generally be of the same capacity as those upon French creek and the

Allegheny river, it ought to have at least equal dimensions with the main canal, viz. 28 feet bottom, 40 at the water line, and 4 feet depth. With these dimensions the mean velocity answering to a discharge of 128 feet per second, will be 11.3 inches; which being determined, it now only remains to ascertain the declivity to which this velocity is practically due.

For this purpose we have the choice of several methods invented by scientific men, from the results of a vast number and variety of experiments. That of Du Buat, is among the most elaborate, and has generally been esteemed the most exact; it is, however, more particularly adapted to the motion of water in conduit pipes, and small confined channels, than to that of a large, open canal. For the latter, the formulæ of Eytelwein is to be preferred, as well for its extreme simplicity, as for its accurate accordance with recent observations in cases of this kind. By this formulæ, with the numerical factor assigned to it by Eytelwein himself, and which agrees extremely well with some of the best observations, I found the declivity answering to the velocity above mentioned, 2.1 inches per mile; but that there might be no danger of falling below the proper limit, I obtained a new co-efficient from the more unfavorable experiments of Du Buat, and others, and by substituting it for that of Eytelwein, obtained a declivity of 2.75 inches per mile, which agrees very nearly with that obtained by Du Buat's own formulæ. This, therefore, may be taken as the declivity, which the surface of the feeder will take, when the discharge, through its section, is 128 cubic feet per second; and if a few inches be added, to produce the initial velocity at the point of derivation, the whole will correspond very nearly with a declivity of 3 inches per mile, which is, therefore, adopted.

I have thus gone through these calculations, without having, as yet, taken any notice of the requisition of the law, by which the capacity of the feeder is limited at 221 cubic feet per second. It will be seen, from what has been said, that this limit is founded on too favorable a view of the supply of French creek, and too unfavorable a view of the demands of the canal; but if it should be thought necessary to conform to it, it may still be done at any future time, by merely drawing down two or three feet from the level of Conneaut lake, and adding as much more to the dam on French creek. In this way a declivity will be obtained whenever the water of French creek is sufficiently abundant, answering to the discharge of 221 cubic feet per second, and, in like manner, may be obtained any intermediate discharge, which may be thought necessary. The map, which accompanies this report, exhibits the line of the feeder, laid down, by means of the cross levels, agreeably to the foregoing principles. It is graduated to an eight feet level, at the foot of Conneaut lake, and ascends uniformly, at the rate just determined, to the feeder dam, on French creek. The entire length is a small fraction less than 22 miles, and the aclivity, on this distance, added to the eight feet at the lake, gives the height of the required head, of water

at Bemis' dam, 13½ feet above the present surface of Conneaut lake, or 7¾ feet, nearly, above the sill of the wheel-gate, at the mill. Considering the specification of the route, as sufficiently minute for present purposes, as delineated on the map; it only remains for the completion of the duty assigned me, to present the following

ESTIMATE.

Commencing with the works at Bemis' mill, and terminating at the foot of Conneaut Lake,

ITEM 1.

The dam—375 yards total length, having a paved waste of 150 feet, walled with dry masonry, and supported with buttresses of masonry laid in mortar.

Dry masonry, viz. 400 perches at 1 00	$400		
988 do. 75	741		
Masonry in mortar, viz. 241 perches at 2 00	482		
Filling in with gravel and clay, 7,525 cubic yards, at 15,	1128 75		
Paving 550 square yards at 90 cents,	495		
Pilage, apron, &c.	225		
Stream lock & buttresses, 8 ft. lockage at 800,	6400		
	$9,871 75		
			9,871 75

ITEM 2.

Regulating Lock.

Excavating,	80		
658 perches masonry at 3 00,	1,974		
382 do. do. 2 50,	955		
Sheet piling, gates, &c.	480		
Paving 1650 square feet, at 20 cents,	330		
	$3,819		
			3,819
Total estimate for the works at Bemis' dam,			$13,690 75

Here follows 1st the estimate for the route on the *western* shore of French creek.

ITEM 3.

From the dam to the Cassawaga embankment, 446 perches—generally improved second bottom—gentle slopes—soil inclining to sand—very easy digging.

Excavation on 446 perches; ⋈ section, 15 yards, 36,875 cubic yards, at 7,	2581 25
Extra cutting on 240 yards, 4080 yards, at 8,	326 40
Puddling 19,430 square yards, at 6,	1165 80
Two culverts, 3 feet chord,	612
Three farm bridges, at 140 each,	420
	$5,105 45

ITEM 4.

Cassawaga embankment, 54 perches in length, average height, 5 feet.

19,305 cubic yards, at 12 cents,	2316 60
Puddling 4158 square yards, at 6 cents,	249 48
	$2,566 08

ITEM 5.

Aqueduct across Cassawaga creek, and the back water of Hindekoper's mill pond.

1st. Estimate for a stone aqueduct of one arch; 30 feet chord and 6 feet rise.

740 perches masonry, at 3 00,	2,220
348 do. do. at 2 50,	870
Pilage, centering machinery, &c.	868
Tow-path, bridge, railing, &c.	112
	$4070

2nd. Estimate for an aqueduct with a *wooden* trunk.

384 perches masonry, at 2 75	1,056
240 do. do. at 2 00,	480
Pilage, machinery, &c.	538
Wooden trunk, tow-path, bridge, &c.	690
	$2,764

ITEM 6.

From the crossing of Cassawaga to Kennedy's Bridge—3½ perches; chiefly along the face of a steep bank; medium digging.

Grubbing on 155 perches, at 20 00 per acre,	110
Excavation on 72 perches; ⋈ section 19 yards, 7524 yards at 8,	601 92
Do. on 270 perches, strong side cutting; ⋈ secction 24 yards. 35,640 yards, at 9 cents,	3,207 60
Dry wall, viz. 12,871 perches at 75,	9,653 25
Extra embankment near Kennedy's Bridge, 3015 yards, at 12,	361 80
Puddling, viz. 11,880 superficial yards, at 6,	712 80
Two culverts of 3 feet,	612
One road bridge,	250
	$15,509 37

ITEM 7.

From Kennedy's bridge to Vanhorn's run—364 perches—improved bottom, chiefly meadow—gentle slopes, and very good digging.

Excavation on 338 perches; ⋈ section 15 yards, 27,885 at 7,	1,951 95
Embankment on 26 perches, average height 4 feet, 6006 yards,	600 60
Puddling 6776 square yards, at 6 cents,	406 56
Two culverts of 3 feet,	612
Three bridges, viz. 1 at 400, one at 250, and one at 140,	790
	$4,361 11

ITEM 8.

Crossing Vanhorn's run, and the adjacent bottom—37 perches.

Embankment on 37 perches, average 7½ feet, 16,958 yards, at 12,	2,034 96
Culvert, 10 feet semi circle,	734
Puddling 2849 superficial yards, at 6 cents,	170 94
	$2,939 90

ITEM 9.

From the right bank of Vanhorn's run bottom, to Telton's station No. 152, (at the commencement of the *steep* bank)—278 perches—gentle sidling ground—undulating in some places—white-oak land—medium digging.

Grubbing on 244 perches, at $30 per acre,	260
Excavation on 264 perches; ⋈ section 19 yards, 27,588 cubic yards, at 9,	2,482 92
Embankment on 14 perches, 3850 yards, at 10 cents,	385
Puddling 8,338 square yards, at 6 cents,	500 28
Five culverts, average chord 4 feet, at 356,	1,780
	$5,408 20

ITEM 10.

From station No. 152, to the left bank of Wilson's run bottom—352 perches, along the face of a steep bank—198, being second bank, and the remainder high hill. The *excavation* and *embankment* of the latter to be supported with walls of dry masonry, with a slope of one-fourth, and the water-ways of the canal reduced to 33 feet at the water line, and a depth of 4½ feet, with a paved slope of forty-five degrees on the side of the tow-path. The *embankment* only to be revetted where the canal passes along the second bank.

Grubbing on 352 perches, at $30 per acre,		360
Excavation on 198 perches; ⋈ section, 26 yards,	28,304 cubic yards.	
Do. on 154 perches; ⋈ section, 18 yards,	15,248 do.	
Total,	43,552 at 9,	3,919 68
Dry wall, viz 21,659 perches, at 75 cents,		16,244 25
Four culverts, average 4 feet chord, at 356,		1,424
Paving 1634 yards of inner slope at 45 cents,		762 30
Puddling 1336 square yards, at 6 cents,		83 16
Tow-path railing, at 1 00 per perch,		352 00
		$23,145 39

ITEM 11.

Crossing Wilson's run and the adjacent bottom—70 perches.

Embankment on 70 perches, average height 9 feet, 38,500 yards, at 12,	4,620
Culvert, viz. 10 feet semi-circle,	734
Puddling 5,290 square yards, at 6 cents,	317 40
	$5,671 40

ITEM 12.

From the right bank of Wilson's run bottom, to Telton's station No. 82—188 perches—gentle slope to the left—oak-land—medium digging.

Grubbing on 144 perches, at $30 per acre,	148
Excavation on 176 perches; ⋈ section 18 yards, 17,424 cubic yards, at 9,	1568 16
Embankment on 12 perches, 7,520 yards, at 10 cents,	752 00
Three culverts, viz. one of 4½ feet, and 2 of 3 feet,	968
Puddling 3,700 square yards, at 6 cents,	222
One farm bridge,	140
	$3,798 16

ITEM 13.

From station No. 82, to No. 73—168 perches, comprehending the steep hill side, below Wilson's run—growth, black and white-oak—soil, moderately easy of excavation—canal to be modified as in item 10.

Grubbing on 168 perches,	180
Excavation on 168 perches; ⋈ section, 18 yards, 16,632 cubic yards, at 8,	1,330 50
Dry wall, viz. 13,860 perches at 75 cents,	10,395
Paving 1848 square yards, at 45 cents,	831 60
Puddling, viz. 8316 square yards, at 6 cents,	498 96
Five culverts of 3 feet each,	1,530
Tow-path railing, at 1 00 per perch,	168 00
	$14,934 06

ITEM 14.

From the station No. 82, to the junction of the eastern and western routes, on Herrington's farm, 722 perches; part undulating, the remainder sideling to the left, and rather steep, oak land, partially cleared; about half, medium digging, the rest easy.

Grubbing on 501 perches,	516
Excavation on 543 perches; ⋈ section 20 ys. 57,530 cub. ys. at 8 cts.	4602 40
Excavation on 155 perches; ⋈ section 28 ys. 23,870 at 9,	2148 30
Embankment on 24 perches; 9966 ys. at 10 cts.	996 60
Dry wall on 45 perches; 990 perches at 75 cts.	742 50
Puddling, viz: 15400 square ys. at 6 cts.	924
Seventeen culverts, viz: 2 of 6 ft. 5 of 4 ft. and 10 of 3 ft.	5654
Two bridges, viz: 1 road bridge, 250, and 1 farm bridge, 140,	390
	$15,973 80

Summary of the estimate for the western route, down French creek.

Item 3. from the dam to the Cassawaga	5105 45
Item 4. Cassawaga embankment	2566 08
Item 5. Cassawaga aqueduct	4070
Item 6. from the Cassawaga to Kennedy's bridge,	15509 37
Item 7. from Kennedy's bridge to Vanhorn's run,	4361 11
Item 8. Crossing Vanhorn's run,	2939 90
Item 9. From Vanhorn's run to the commencement of steep bank,	5408 20
Item 10. Along the steep bank to Wilson's run,	23145 39
Item 11. Crossing Wilson's run,	5671 40
Item 12. From Wilson's run to Telton's station, No. 82,	3798 16
Item 13. Along the steep bank from No. 82 to No. 73,	14934 06
Item 14. From No. 73 to the point of concourse of the two routes,	15973 80
Total for the western route,	$103,482 92

Here follows, secondly, the estimate for the route on the east shore of French creek.

ITEM 15.

From the dam to the level picket, No. 246—330 perches, through a meadow bottom, partly at the foot of the second bank—clay soil—very easy digging.

Excavation and embankment, mean section 20 yards, 36300 yards, at 7 cents,	2541
Two small culverts,	612
Two road bridges at 250 dollars,	500
	$ 3,653

ITEM 16.

From the level picket No. 246 to No. 236—180 perches, along the face of a steep second bank, washed by the floods of French creek, soil clay and gravel, resting upon sand stone schist.

Grubbing,	90 00
Excavation on 180 perches; ⋈ section 20 yds.—19800 at 8 cents.	1584 00
Dry wall, average 8 ft.—3960 perches at 62½ cts.	2475 00
Three small culverts.	918 00
Puddling, viz.—693 superficial yds. at 6.	415 80
	$5482 80

ITEM 17.

From picket No. 236, to a point 7 perches south of the position between 233 and 234—142 perches—partly along the face of a second bank, of moderate declivity; the remainder meadow bottom—easy digging.

Excavation on 134 perches, ⋈ section 18 yards, 13,266 cubic yards, at 8,	1061 28
Embankment on 8 perches, 2442 yards, at 10 cts.	244 20
66 perches dry wall, at 75 cents,	49 50
Three culverts, average 4 feet chord,	1068 00
Puddling, viz. 3388 square yards, at 6 cents,	203 28
Re-forming 350 perches of common road, occupied by this and the preceding sections, 2 50 per perch,	875 00
	$3502 26

ITEM 18.

From the point seven perches south of position 233–4, to the bank south of M'Gaw's mill, crossing the tail-race—76 perches; deep side cutting along the wash bank of French creek; mellow soil.

Excavation on 70 perches; ⋈ section 45 yards, 17,325 yards. at 7 cents,	1212 75
Dry wall on 76 perches, to 2 feet above extreme floods, 3550 perches, at 1 dollar,	3550
Loose rubble to be thrown down at the base of the wall, 1920 perches, at 50 cents,	960
Puddling, viz. 3850 square yards at 6 cents,	231
One culvert of 8 feet, and one of 3,	866
	$6819 75

ITEM 19.

From M'Gaw's mill to the level picket, No. 216; 467 perches—passing through the village of Meadville. Moderate deep cuttings near the mill, and at the south part of the village; the residue chiefly bottom land, gently inclined; strikes the second bank near the end; soil, loam and clay; easy digging.

Slight grubbing on 172 perches,			103 20
Excavation on 324 perches; ⋈ section 14 yards,	24,948 yds.		
do. 74 perches; ⋈ section 25 yards,	10,175		
do. 64 perches; ⋈ section 36 yards,	12,320		
	47,443 at 8,		3795 44
Embankment on 5 perches, 2310 yards, at 12 cents,			277 20
12 foot culvert at Mill run; 381 perches at 2 50,			952 50
Five small culverts, at 306 each,			1530 00
Puddling 2420 sq. yards, at 6,			145 20
Thirteen bridges; average 250 dollars,			3250 00
			$ 10,053 54

ITEM 20.

From the picket No. 216 to No. 204. 454 perches, along the face of the second bank, generally steep, but of easy excavation. Bottom on the right, and from 10 to 15 feet below.

Grubbing,	80 00
Excavation and embankment on 414 perches; ⋈ section 19 yards, 43263 yards, at 8 cents,	3461. 04
Embankment on 40 perches—11440 yards, at 10,	1144 00
Dry wall, viz. 3531 perches, at 75 cents,	2648 25
Eight culverts, average 4 ft. chord,	2848 00
Puddling, viz. 16742 square yards, at 6 cents,	1004 52
Three bridges, viz. one at 400, and two at 140 each,	680 00
Re-forming 430 perches of road, occupied by this and the preceding section, viz. 180 perches at 6 00, and 250 at 2 50,	1705 00
	$ 13,570 81

ITEM 21.

From the picket No. 204 to No. 191—391 perches. This section, rather uneven on the first and last part, but generally favourable—all improved, and of easy excavation.

Excavation on 302 perches, ⋈ section, 15 yards,	24,915 yds.		
Do. on 62 perches, ⋈ section, 30 yards,	10,230		
Do. on 4 perches, ⋈ section, 45 yards,	990		
	36,135 at 8 cts.	2890	80
Embankment on 23 perches, 8278 cubic yards, at 10 cents		827	80
Six culverts, average four feet span		2136	
Puddling, viz. 13,080 square feet, at 6 cents		784	80
Three bridges, viz. one at 250 and two at 140		530	
		$7,169	40

ITEM 22.

From Picket No. 191 to No. 175—527 perches—ground generally regular—soil rather stoney in one or two places—otherwise good—chiefly improved.

Grubbing on 202 perches	116	
Excavation on 462 perches, ⋈ section, 17 yards, 43,197 yards, at 9 cents	3,887	73
Extra depth on 40 perches, ⋈ section 66 yards, 14,520 yards, at 10 cents	1,452	
Embankment on 25 perches, 7,520 cubic yards, at 12 cents	902	40
Four culverts, viz. two of 4 and two of 3 feet chord	1,324	
Puddling, viz. 14,938 square yards, at 6 cents	896	28
Three farm bridges	420	
	$8,998	41

ITEM 23.

From picket No. 175 to No. 158, 312 perches. Surface uneven; growth black and white oak; soil rather stoney.

Grubbing on 129 perches		115	20
Excavation on 220 perches, ⋈ section 22 yards,	26,620		
Extra depth on 40 perches, ⋈ section 66 yards,	14,520		
	41,140 at 10	4,114	
Embankment on 52 perches, at 5 feet, 15,158 yards, at 10 cents		1,515	80
Six culverts, viz. two of 4 feet, and four of 3 feet		1,936	
Puddling, viz. 9,240 square yards, at 6 cents		554	40
Three farm bridges, at 140		420	
		$8,540	20

ITEM 24.

From picket No. 158. to the crossing of French creek, 126 perches; the first 46 a high bank of the creek, exposed to slips; the remainder steep sidling ground; oak soil; generally good digging.

Grubbing		88 40
Excavation on 80 perches, (modified profile) ⋈ section 15 yards,	6,600	
Do. on 46 perches, ⋈ section 40 yards,	10,120	
	16,720 at 8,	1,337 60
Dry wall, viz. 6,930 perches, at 75 cents		5,197 50
Paving, viz. 880 square yards, at 25 cents		220
Puddling, viz. 6,238 yards, at 6 cents		374 28
Two culverts		612
		$7,829 78

ITEM 25.

The aqueduct, viz. of stone. Three arches of 72 feet clear span, and 12 feet rise. Piers 12 feet; total length of water-way 264 feet; water-way 30 feet wide and 4½ deep.

Masonry, viz:—foundation, wings, and spandrels, 3,840 perches, at 2 50	9,600
Piers and abutments, 2,400 average, at 3 00	7,200
Arches, head-walls, and parapets, 1,622, at 3 50	5,677
Coping, viz. 2,640 square feet, at 75 cents	1,980
Flag pavement, viz. 7,920 square feet, at 20	1,584
Cribs, grillage, sheet piling, &c. for abutments and piers, at 350 each	1,400
Centering and machinery	3,600
Iron railing, 5,280 lbs., and iron bolts, cramps, &c. 6,000 lbs., 11,280 lbs. at 10 cents	1,128
	$32,169

REMARK.

The above, or some similar structure of stone or iron, is particularly recommended for this scite, on account of its superior *permanency* and *stability*. A wooden superstructure would probably reduce the first expense to about 20,000 dollars; but the inferiority of this material, in these respects, renders it particularly objectionable on the line of a *Feeder*, upon which the navigation on the whole line of canal essentially depends.

ITEM 26.

From the western extremity of the aqueduct to the junction of the two routes, as before specified, comprehending an embankment across the western bottom of French creek. Soil sandy, and very easy digging.

Grubbing on 79 perches	82	
Excavation on 112 perches, ✕ section 18 yards, 11,088 yards, at 7 cents	776	16
Embankment on 60 perches, average height 15 feet, 60,390 yards, at 12	7,246	
One culvert of 8 feet chord, at the foot of the second bank	560	
Puddling, viz. 13,244 square yards, at 6 cents	694	64
	$9,358	80

SUMMARY of the estimate for the EASTERN ROUTE down French creek.

Item 15. From the dam at Bemis' mill to picket No. 246,	3,553	
16. From No. 246 to 236	5,482	80
17. From No. 236 to the deep cutting above M'Gaw's mill,	3,502	26
18. Deep cutting, &c. at M'Gaw's mill,	6,819	
19. From M'Gaw's mill, through Meadville, to No. 216,	10,053	54
20. From No. 216 to No. 204,	13,570	81
21. From No. 204 to No. 191,	7,169	40
22. From No. 191 to No. 175,	8,998	41
23. From No. 175 to No. 158,	8,540	20
24. From No. 158 to the crossing of French creek,	7,829	78
25. The aqueduct,	82,169	
26. From the aqueduct to the junction of the two routes,	9,358	80
Total for eastern route,	$117,047	

Which gives an average of about eight thousand dollars per mile, after deducting the expense of the aqueduct and embankment, at the crossing of French creek.

REMARKS.

By comparing the estimates of the two routes, it appears that the expense of that on the *east* side, including an aqueduct of *stone*, will exceed that on the *west*, by 13,564 dollars; and it may be added, that the assessment of damages on the east side, from the superior value and improvement of the land, will also, in all probability, exceed that on the west. But on the other hand, there are several considerations of no small weight, in favour of the eastern location In the first place, passing through a more settled country, and particularly through the village of Meadville, it will more effectually accommodate the local interests of that vicinity, than the route on the west side, a considerable portion of which passes along the slopes of high

and steep hills, having very little capacity for improvement.—Secondly. From this character in its topography, the route on the west side is more exposed to expensive contingencies, both in the construction and maintenance of the canal, than that on the east.—Thirdly. The navigation of the *upper* part of French creek, can be most conveniently and safely connected with the location on the *east* side; and it is believed that an improved navigation on the *lower* part of the same stream may also be most advantageously combined with such a location. Under these circumstances, the *eastern shore*, notwithstanding the additional expense, seems entitled to the preference; but as the subject involves other considerations than those of mere art, I submit it respectfully to the consideration of the board, and proceed without further delay to the remaining particulars of the estimate.

ITEM 27.

From the junction of the two preceding routes, to the end of the tenth mile, from Conneaut lake, 595 perches. Sideling upland, undulating in some places; partially cleared; soil sandy, and very easy of excavation, except a small proportion of stony oak land.

Grubbing on 270 perches,	285
Excavation on 477 perches, ⋈ section 15 yards, 39,353 yards, at 8 cents,	3,148 24
Extra depth on 30 perches, ⋈ section 30 yards, 4,950 yards, at 8 cents,	396
Embankment on 88 perches, 39,430 yards, at 10	3,943
Six culverts, viz three of 4, and three of 3 feet,	1,936
Puddling, 21.000 square yards, at 6,	1,260
Two bridges, viz. one farm and one road bridge,	390
Double stop gate, and draught gates, as in item 32,	1,175
Weir, as in item 33,	511 60
	$13,044 84

ITEM 28.

From the end of the 10th mile, to the beginning of the 9th, from Conneaut lake, 540 perches. Sideling upland, slightly undulating, about half loam and clay; the remainder white oak land, rather stony, generally cleared.

Grubbing on 195 perches,	195
Excavation on 484 perches; ⋈ section 16 yards, 42,592 yards, at 9,	3,833 28
Extra depth on 66 perches; ⋈ section 28 yards, 10,164, yards, at 9,	914 76
Embankment on 90 perches; average 4 feet, 20,790 yards, at 10,	2,079
Ten culverts, average 4 feet, at 356 dollars,	3,560
Puddling, viz. 21,000 square yards, at 6 cents,	1,260
Four bridges, viz. 1 at 400, 1 at 200, and 2 at 140,	880
	$12,722 04

ITEM 29.

From the end of the 8th mile, near M'Fadden's, to the left (up-land) bank of Watson's run, 1,080 perches. Sideling very regularly and gently to the left; 1¼ miles cleared and improved, chiefly in meadow, the remainder wooded with oak, sugar maple, hickory, and black walnut; soil chiefly rich loam, resting upon clay.

Grubbing on 680 perches,		700
Excavation on 970 per. ⋈ section 16 yards, 85,360 yards, at 8 cents,		6,828 80
Extra depth on 48 perches; ⋈ section 33 yards, 8,712 yards, at 8,		696 96
Embankment on 62 perches; 13,180 yards, at 10,		1,318
Eighteen culverts, average 4 feet, 356,		6,408
Puddling, viz. 15,400 square yards, at 6 cents,		924
Eight farm bridges, at 140 each,		1,120
		$18,095 76

ITEM 30.

Crossing Watson's run, and adjacent bottoms.

Grubbing,		30
Embankment on 36 perches, average 7½ feet, 16,640 yards, at 12 cents,		1,996 80
Excavation on 42 perches; ⋈ section 14 yards, 3234 yards at 7 cents,		226
Two culverts, average 6 feet, at 457,		914
One do. of twenty feet span, 5 feet rise, viz.		
Masonry, 410 perches, at 2 75	1,127 50	
Do. 372 do. at 1 62½	604 50	
Excavations, centering, &c.	344	
		2,076
Puddling, viz. 6,160 yards, at 6 cents,		369 60
Clearing the channel of Watson's run,		300
		$ 5,912 40

ITEM 31.

From the termination of the embankment of Watson's run, to the end of the second mile from Conneaut lake, 760 perches; white-oak, hickory, and maple up-land, sideling to the left; soil loam and clay.

Grubbing on 675 perches,		765
Excavation on 510 perches; ⋈ section 15 yards,	29,568	
Do. 144 do. ⋈ section 30 yards,	23,760	
Do. 106 do. do. section 40 yards,	22,600	
	75,928 at 8 cents	6,074 24
Eight culverts, average 4 feet, at 356 dollars,		2,848
Extra labor at 5 short embankments, viz. 3,500 yards, at 10 cents,		350
Puddling, viz. 14,000 square yards, at 6 cents,		840
Two farm bridges, at 140 each,		280
		$11,157 24

ITEM 32.

From the end of the second mile, to the outlet bridge, near Cummings' tavern, foot of Conneaut lake, 620 perches. A small proportion swail, and about half a mile sideling ground; the remainder rich, level bottom; growth, hard maple, and bass wood, with some pine and hemlock; soil, loam, and strong clay. (It is not improbable, that a more direct route may be found for this portion of the line, farther south, at the expense, however, of a great proportion of embankment.)

Grubbing on 560 perches,		596
Excavation on 520 perches; ⋈ section 15 yards, 42 900 yards at 8 cents,		3,432
Embankment on 120 perches; average height 4½ feet 31,020 yards, at 12,		3,722 40
Four culverts, viz. 1 of 8 feet, 1 of 6 feeet, and 2 of 4 feet,		1,729
Puddling, 9,240 square yards, at 6 cents,		554 40
Double stop gate and draught, at the junction with the lake,		
Masonry, viz. 246 perches, at an average of 2 50,	615	
Gates, sheet piling, foundations, &c.	560	
		1,175
		$11,208 80

ITEM 33.

Dams, bridge and weir, at the foot of the lake. The former constructed of the best wharf-work, filled in with clay and gravel.

Dams, 3 in number, total length 762 yards, average height 8 feet; 36,100 feet squared timber, laid at 2½ cents,	902 50		
15,240 cubic yards filling-in, at 20 cents,	3,048		3,950 50
Weir of 20 feet waste, dry walled and filled in with clay and gravel, with buttresses of masonry; 56 perches dry wall, at 1 00,	56		
104 perches masonry in mortar at 2 00,	208		
168 yards filling-in, at 20 cents, and 56 square yards pavement, at 45 cents,	49 60		
Pilage, apron, tow-bridge, &c.	198		
			511 60
Road bridges, and embankment,			1,200
			$5,662 10

Summary of the estimate from French creek to the foot of Conneaut lake, including the dams, weirs, draught-gates, &c. at the latter.

Item 27. From the junction of the French creek route to the end of the 10th mile,	13,044 84
Item 28. From the end of the 10th mile to the beginning of the 9th,	12,722 04
Item 29. From the end of the 8th mile to Watson's run,	18,095 76
Item 30. Crossing Watson's run,	5,912 40
Item 31. From Watson's run to the end of the 2d mile,	11,157 24
Item 32. From the end of the 2d mile to the foot of Conneaut lake,	11,208 80
Item 33. Dams and other works,	5,662 10
Total,	$77,803 18

Which, by excluding the cost of the works at Conneaut lake, gives the average cost on this part of the line, at about 6,000 dollars per mile,

The expense of the entire feeder may now be summed up as follows:

1. Works at Bemis' mill, on French creek,	13,690 75
2. Construction of the feeder down the valley of French creek, by the eastern route, (aqueduct included,)	117,047 00
3. Construction of the feeder from French creek to Conneaut lake, and the works at the latter,	77,803 18
	$208,540 93
Add for fencing, at 240 per mile,	5,280 00
And for engineering and superintendence,	18,000 00
Grand total,	$ 231,820 93

This estimate supposes the works to be constructed according to the best models, and in the most durable and substantial manner. If it should appear large, it will be recollected that several items of *extraordinary* expense are also embraced in it, such as the works at *Bemis' mill*, the *crossing* of *French creek*, the crossing of Watson's run, and the dams at the foot of Conneaut lake, and if these be deducted from the total estimate for *construction*, the remainder will not exceed an average of 6,500 dollars per mile.

I have not thought it necessary, in the preceding plans and discusions, to introducce the consideration of the water power which will be created at Meadville and elsewhere, down the valley of French creek, by means of the feeder. The surplus water of the creek may not, indeed, during the height of a dry season, be equal to the maintenance of a very efficient power, but will be very abundant at all other seasons of the year; and having a fall of 20 ft. at Meadville, and of from 20 to 30 ft. at the places below, will afford a very commanding and valuable power for mills and machinery. The additional volume for this purpose can be thrown into the feeder either by raising the head of water at the dam, or by increasing the transverse dimensions of the canal, and in either case without any great augmentation of the expense.

In addition to the surveys and measurements heretofore detailed, it may be proper here to observe, that accurate surveys were also executed of all that part of French creek between Dixon's mill dam, (four miles above Meadville,) and the mouth of Conneaut outlet, and of the latter as far up as Hart's bridge; from which, together with the survey of Conneaut lake, and across the dividing ridge, and of the different level lines, the map accompanying this report has been chiefly delineated.

It was my intention, after closing my line at Bemis' mill, to have executed some further levels in that vicinity, and at Conneaut lake, particularly with reference to the question of a summit level independent of the latter; but unfortunately, in proceeding to the lake for that purpose, the levelling instrument, which was extremely infirm, and had been on that account the subject of extraordinary care and caution, during the whole survey, became so much impaired as to render any further use of it wholly impracticable. At this point, therefore, my operations were necessarily brought to a close.

It only remains, in closing my report, to do justice to the zeal and ability of my assistants Messrs. Brown, Fulton and Le Barron, the first as principal assistant and draughtsman, the second as surveyor, and the third as an assistant with the level. The alacrity with which they, and indeed every member of the party, co-operated in pressing forward the operations of the survey, enabling me to complete them within the period to which

my attendance was necessarily restricted, deserves a grateful acknowledgement on my part, and I trust will secure to them the just commendations of the board.

All which is respectfully submitted.

D. B. DOUGLASS.

U. S. Mil. Academy,
West Point, January 1, 1827.

No. 3.

Report on the survey along the Allegheny, from the mouth of Kiskeminetas, to the mouth of French creek, by James Geddes, Esq.

To the Board of Pennsylvania Canal Commissioners.

GENTLEMEN,

Pursuant to your instructions, a survey of a line of canal along the Alleghany river from French creek to Kiskeminetas has been made. Calculations thereon, with maps, profiles, &c. are respectfully presented.

That part of the river Alleghany above mentioned, runs not in a valley, like other rivers, but in a deep bed, far below the general surface of the country, making its way at the foot of precipitous rocky steeps, which form, either one shore or the other, in almost the whole of said distance. There are few places where shores opposite are *both* rocky; one side being hills covered with oak, and rising from the water's edge at a slope of one or two hundred feet in forty perches. In some places a margin of two or three rods wide is low enough to be covered by the floods, and these flats are seldom of greater extent. This stream is very favourable, therefore, for improving by dams and locks, so little land would be inundated, the almost insuperable objection to damming other rivers; and there are certainly few streams more difficult to be improved by a *side-cut*.— The navigation of the river being perfected, as it may be, at a small expense, steamboats would be preferable to any other mode of navigating it, as towing paths would be of little use on a stream, the floods of which are 20 and in many places 30 feet above its low water surface. The steep rocky shores change sides of the river frequently; seldom remaining on the same side for a length of two miles in any one place. Rocks of immense size lie at the foot of these steeps, evidently "time fallen," having been dislodged from above by the action of frosts. Some have fallen into deep water, a single rock of a size sufficient to build a lock: they are sand-stone, and cleave readily in any direction. Of this sand stone, the fine Pittsburg glass is made; the supply of the manufactories is taken from near the

mouth of the Clarion, the rocks there being freest from impurities. Where a stream issues from a chasm in the shore, there is often a shallow place, and a fall in the river of three or four feet. A remarkable characteristic of this river, is its consisting altogether of long sheets of deep still water, separated by short shallows, seldom exceeding twenty or thirty rods in length. Wherever the river washes the steep mountain's base, it is deep on that side, with few exceptions, the same degree of steepness continuing under the water that is to be seen above it, though a beach is formed by the debris of the mountain in most places; the pebbly shore on the opposite side is invariably shallow.

The levelling, which was on the west side of the river, was carried along at the base of the very steep mountains, from rock to rock, at the water's edge, and in one place for about a mile, it could not be done on that side of the stream, and was performed on the east side.

In conducting a canal on the margin of the Allegheny river, the great difficulties to be overcome, will be along the face of the rugged steeps above described. To save expenses, the level that would just put the canal above the reach of the high floods, ought to be pursued as much as the situation of the locks will allow of. Whether the canal in such situations is supported by masonry, or by a bank based in the river, the lower the level on which the canal is carried, the less expensive will the walls or banks be; the canal is therefore in every place laid but little above the river level, and mostly close to its banks; compelled to follow it through all its sinuosities. Walling is the only method, where the mountain is not only steep but an impenetrable mass of rocks. Another case occurs where walls are the only safe mode; large *slips* from fifty to seventy feet above the river level, have taken place in many spots, and threatening appearances of more are visible; in such places it would be dangerous to penetrate the mountain for stuff to form a bank, and a wall to contain the canal, between it and the menacing steep, is the only security against these disastrous *slips*.

Some miles of canal are estimated at nearly fifty thousand dollars. The most expensive section (length half-a-mile and eight rods) of canal in the Mohawk valley, in the state of New York, cost 24,000 dollars—no locks or aqueducts in either case. The vast masses of rock along the Allegheny, which can be removed by blasting only, will swell the item of powder to a great amount; and there are many places where little earth is to be found on the line where the canal must run.

About seven and a half miles above Kittanning, argillaceous slate is seen, composing part of the perpendicular shore, in the cliffs of which, plume allum presents itself.

The mineral wealth of the Allegheny country is very important. Salt, iron and coal are obtained in many places, on the part of the river which has been surveyed. The salt wa-

ter is found chiefly below the mouth of Mahoning creek, and little coal is got above the mouth of Clarion river; but the iron is every where. Furnaces are in operation at Bear creek, Scrub grass creek, and Sandy creek. The quality of the ore on French creek, is considered suitable for bar-iron, and a forge is now erecting near Franklin. Of the agricultural products of the country, little can be said, and little may be expected. Mineral oil is collected, but not in large quantities, under the bank, at the west side of the river, in the third mile.

There is no supply of water from land streams that can be taken into a canal, on the west side of the river, between Sandy creek and Kiskeminetas. Big and Little Scrub grass and Bear creeks yield no water in a dry time worth conveying to a canal. The supply of water to the proposed canal, may, notwithstanding, be furnished in great abundance. French creek, from the pond of the forge now erecting, may be thrown in (and if a canal be continued up French creek) with great facility, and in quantity far beyond the requisite demand. Sandy creek, through a feeder of no great length, (see No. 2, in the atlas,) is all at command, and a fine stream at all times. In the eighteenth and nineteenth miles, the river falls eight feet and a half, in nine hundred and thirty-five yards, and a wall of timber and stone, running parallel with the shore, and made water tight for said distance, would afford a water power sufficient to throw up water twenty-three feet high—the elevation of the canal above the river surface at that place.* Running said wall, at a distance of fity or sixty feet from the shore, much spare water might be had, which would be of great value in a country so very destitute of water power, as an extensive region here is. There is not, on the portion of the river surveyed, any ten miles together, that water may not readily be raised in like manner; and at every place, the spare water would be of great importance to the surrounding country, besides adding to the revenue of the canal, by leasing or selling water rights.

Making such a wall, half a mile long, and of an average height of six feet, would cost, when gravelled, about one thousand dollars. The massive walls, necessary to protect from floating ice, a building to contain the machinery, would be a more serious item of expense, the cost of which would vary as facilities of getting stone would vary, in different places. A sum of five thousand dollars may be set down for each. These erections have not been planned, strictly, at equal distances from each other, as the waste, from soakage and evaporation, would direct, but are generally at places where the most fall can be obtained by the shortest wall. They are placed in the nineteenth mile, the thirty-first, the forty-first, the fifty-eighth

* Three locks were planned at this place, calculating a short feeder to let the water of the river into the third level in the canal; but the long distance of extra height of bank required, to keep out the river floods, makes the mole and dam the more preferable made.

and the seventy-third, making five in number, amounting, at five thousand each, to twenty-five thousand dollars.

There are twenty-six pounds between the locks, on each of which a waste weir will be required.

The fall from the forge pond, on French creek, to the mouth of Kiskeminetas, is 258.48 feet. Take therefrom 23.48 feet, for fall in French creek, and there remains for the fall in Allegheny river, two hundred and thirty-five feet, from the mouth of French creek to the mouth of Kiskeminetas.

Fencing will not be required on the towing path side, where there is walling, or where the outside of the bank is formed of rough stones nearly perpendicular. The other side will need no fence where the canal runs along the face of the steep mountain. Fifty miles of fence, instead of one hundred and seventy-five miles, (the length of a fence on both sides,) is judged sufficient.

The following estimates, per mile, of the cost of common excavation, embankings, deep cuttings, aqueducts, culverts and bridges, with the Sandy creek feeder, has been made out, by actually surveying and levelling a line, and locating all the locks. The amount of cubic yards to be moved, in each mile, was made out, and a value put on each cubic yard, varying according to the nature of the stuff. The aqueducts, feeder, culverts and bridges, all varied in value, according to their respective sizes and situations.

Estimates per mile, &c.

MILES.	DOLLS.	MILES.	DOLLS.
1st,	3,819	24,	15,647
2,	22,792	25,	10,000
3,	47,520	26,	46,200
4,	4,292	27,	14,184
5,	42,246	28,	7,150
6,	4,405	29,	20,619
7,	8,748	30,	15,305
8,	27,548	31,	12,104
9,	27,550	32,	3,720
10,	4,460	33,	31,100
11,	16,800	34,	13,672
12,	4,999	35,	9,581
13,	35,200	36,	9,740
14,	34,405	37,	4,080
15,	3,600	38,	23,540
16,	14,463	39,	9,412
17,	10,489	40,	21,808
18,	23,310	41,	3,800
19,	3,810	42,	4,020
20,	15,485	43,	15,700
21,	15,817	44,	5,428
22,	16,487	45,	22,962
23,	16,600	46,	19,860

MILES.	DOLLS.	MILES.	DOLLS.
47,	3,500	69,	14,850
48,	6,800	70,	6,250
49,	18,656	71,	7,177
50,	12,775	72,	4,973
51,	3,316	73,	47,179
52,	5,820	74,	39,221
53,	14,875	75,	4,020
54,	21,120	76,	32,916
55,	14,380	77,	30,993
56,	12,730	78,	37,515
57,	4,275	79,	5,568
58,	25,215	80,	7,324
59,	5,200	81,	49,280
60,	21,296	82,	14,005
61,	16.635	83,	3,800
62,	20,350	84,	10,672
63,	28,357	85,	7,929
64,	10,246	86,	13,968
65,	4,862	87,	13,400
66,	48,679	918 yards of the	
67,	29,067	88th.	8,262
68,	14,930		
			$1,440,393

The whole cost will stand thus:

For common excavation, &c &c.	$1,440,393
lockage, 235 feet, at $500 per foot,	117,500
five feeders, at 5,000 dollars each,	25,000
waste-weirs, 26, at 50 dollars each,	1,300
fencing, 16,000 perches, at 70 cents,	11,200
Total amount,	1,595,393
Add for contingencies, superintendence, and engineers, 10 per cent.	159,539
	$1,754,932

All which is submitted with great respect, by your most obedient servant,

JAS. GEDDES,
Engineer.

December 6, 1826.

No. 4.

Report on a survey of the North Branch of Susquehanna, by John Bennet, Esq.

To the board of Canal Commissioners of Pennsylvania.

In pursuance of instructions received from judge Scott, a member of the board to survey and examine the route for a canal from Northumberland to the northern boundary of the state, upon the Tioga or Chemung and the Susquehanna rivers, after having been furnished with the requisite instruments, and having procured the necessary hands and made provision for their sustenance and accommodation, I commenced the work on the 15th of July, at the state line, upon the Tioga river. I ascertained the elevation of the bank, and benched a hickory 20.194 feet above the surface of the water; thence, I run a line of levels down the east bank of the river, 3 miles 72.26 chains, and benched a locust near the village of Athens, and 11 chains further benched a black oak upon the bank of the Tioga or Chemung river, 16.911 feet above the surface of water. Whole distance run upon this river, 4 miles 3.26 chains, fall 19.616 feet. Upon this line the ground is entirely alluvial, composed of clay sand, and for several short distances, a mixture of gravel, in which clay predominates. But upon the west bank of the river, there are 20 chains of rocky ledge, 36 chains of side long hill, and the residue of the distance, the ground is alluvial and similar in texture to that on the east bank, which is the general character of all the alluvial grounds in the valley of the Susquehanna. In this distance there are two small rivulets only, on the west; and but one on the east side of the river.

I then commenced upon the Susquehanna, and ascertained the elevation of the bank, and benched a yellow pine standing in the state line, on the west bank of the river, 29.211 feet above the surface of the water.

Thence, I extended a line of levels to the before mentioned black oak, near the village of Athens, and standing upon the east bank of the Tioga river, 4 miles 31.51 chains. Fall, 13.296 feet to the surface of the water in the Tioga river. In this distance, on the west bank, soil alluvial. On the east 10 chains side long hill, residue of the distance alluvial. Streams, on the west, Shepherd's creek, a fine mill steam 40 feet wide from bank to bank, and one small rivulet. On the east, two small rivulets. I then extended a line of levels from the benched black oak, crossing the Tioga above the bridge and down upon the west side of the Susquehanna, 5 miles 31.7 chains. Fall 17.684 feet. Upon the west, soil alluvial. Upon the east, 50 chains nearly perpendicular rock, residue alluvial. Streams, on the west, the Tioga, nearly 36 perches from bank to bank, and five small streams. Upon the east two small streams.

Thence, down said river one mile 24 chains. Fall 2.026 feet. Soil, on the west, steep side hill or mountain composed of loose stone and gravel. On the east side, alluvial. Streams, on the west, none. Upon the east, one small one.

Thence 5 miles 37.1 chains. Fall 15.375 feet. The soil for one mile 31.9 chains, is composed of large loose and shelly rock nearly purpendicular, and 43 chains steep side hill, composed of loose stone and gravel, and the residue of the distance 3 miles 42.2 chs. alluvial. Upon the east side, one mile 24 chs. steep side hill or mountain, loose stone and gravel. The residue of the distance alluvial. Streams, upon the west four small rivulets, upon the east one. Thence 3 miles 9.6 chs. to the village of Meansville, benched a yellow pine upon the bank of the river, near the court house, 21,166 feet above the surface of the river. Fall in the river, 8.979 feet. Upon the west, soil one mile 65.4 chains, side long hill, gravelly and the residue alluvial. Upon the east side, 3 miles 10 chains of steep side hill, composed of loose rock and gravel. Streams, upon the west, Sugar creek, which is a fine mill stream, 50 feet wide; at the place where I crossed it is 20 chains from main bank to bank, it is 10 chains in width a short distance higher up. There is one other small run at the town of Meansville. Upon the east none. I then continued my line of levels to Means' ferry, 29.4 chains, where I crossed to the east side of the river, and extended my line 4 miles 67.25 chains, through Wysox township. Fall 15.304 feet. Soil, on the east, alluvial, except 26 chains of steep hill, (with some slips,) composed of a mixture of clay and gravel. On the west side, one mile and 20 chains of large loose rock, nearly perpendicular, and 31 chains of steep side hill, the remaining part of this distance alluvial.

Thence six miles 12.7 chains. Fall 17.584 feet. Soil, on the east, 25 chains, steep hill, partly rock, and partly clay and gravel, with some slips; 59.2 chains of steep side hill, composed of loose stone and gravel; the residue alluvial. On the west one mile 20 chains of rock, nearly perpendicular, (at Standing stone,) 75 chains of steep side hill. The residue of the distance alluvial. Streams on the west, five small streams, and Romefield's creek, which is a considerable mill stream, 10 perches from bank to bank. On the west, Duval's creek, which is a small mill stream, and three small rivulets.

Thence along French town mountain, 2 miles 39,4 chains. Fall 9.801 feet. Soil, on the east, 2 miles 3.4 chains, loose stone and clay of sufficient width for a canal. The residue, alluvial. On the west alluvial. Streams, on the east, none. On the west, (through Frenchtown,) five small rivulets.

Thence 2 miles 55.35 chains. Fall, 2.4 feet. Soil, on the east, alluvial. On the west, 30 chains of perpendicular rock, or nearly so, and one mile 67 chains of side hill of loose rock and gravel, residue alluvial. Streams, on the east, 4 small rivulets. On the west, none.

Thence 2 miles 50 chains. Fall 4.372 feet. Soil, 19 chains, ledges of loose rock, one mile 21 chains of steep side hill, the residue alluvial. On the west, soil alluvial. Streams, on the east one small one. On the west, four small rivulets.

Thence 4 miles 35.75 chains. Fall 10.414 feet. Soil, on the east, alluvial. On the west, 36 chains of perpendicular rock, and one mile of steep side hill, composed of loose stone and clay. Streams, on the east, Wyalusing creek, 26 perches from bank to bank, and four small rivulets. On the west, Little sugar creek, and one small rivulet.

Thence along the mountain, above Wyalusing falls, 3 miles 16 chains, to the line between the counties of Bradford and Luzerne. Fall, 6.701 feet. Soil, 10 chains of ledges, 2 miles 66 chains gentle slope, composed of loose stone, rock and clay; residue alluvial. On the west, alluvial. Streams, on the east, one small rivulet. On the west, none.

Thence, (in Braintrim,) 3 miles 75.1 chains. Fall 5.455 feet. Soil, on the east, alluvial. On the west, 2 miles 13 chains of steep side hill. Streams on the east, Big Tuscarora creek, of considerable magnitude; 10 perches from bank to bank. Little Tuscarora, about the same width, but not so strong a stream; also two small rivulets. On the west three small rivulets.

Thence 74 chains. Fall, 1.327 ft. Soil, on the east, 48 chains, part ledges, and part loose stone and clay, with some slips; residue alluvial. On the west, alluvial. Streams on the east, none. On the west, one small rivulet.

Thence 2 miles 18.25 chains. Fall, 5.048 feet. Soil on the east, alluvial. On the west, one mile forty-three chains, steep side hill, composed of loose stone, with gravel and clay. Streams, on the east, two small creeks and two small rivulets. On the west, three small rivulets.

Thence one mile 34.1 chains. Fall, 4.317 feet. Soil, on the east, 35 chains, steep, shelly rock, and 35 chains of steep side hill, composed of loose stones, clay and gravel, residue alluvial. On the west, two small rivulets. On the east, none.

Thence 2 miles, 64.9 chains. Fall, 2,655 feet. Soil, on the east, 22 chains of steep side hill, some loose rock, clay and gravel; the residue alluvial. On the west, one mile of ledges, nearly perpendicular, and 24 chains of steep side hill. Streams, on the east, the Mashopin, a fine mill stream, and two small streams. On the west, two small rivulets.

Thence, one mile 40.2 chains. Fall, 1.148 feet. Soil, on the east, 26 chains of ledge, and one mile 36 chains of steep side hill, composed of loose stone, clay and gravel. On the west, alluvial. Streams, on the east, none. On the the west, little Mahoopeny creek, which is a good mill stream.

Thence two miles 30.2 chains. Fall, (part of the horse race,) 8,656 feet. Soil, on the east, alluvial. On the west, one mile of ledges of loose rock. Streams, on the east, two small rivulets. On the west, Big Mahoopeny creek, upon which are a number of mills.

Thence, one mile 59.75 chains. Fall, 4.626 feet. Soil, on the east, 30 chains of ledges; the residue steep side hill. On the west, alluvial. Streams, on the east, none. On the west, three small rivulets.

Thence, 4 miles 1.05 chains. Fall, 8.587 feet. Soil, on the east, 20 chains steep side hill; the residue alluvial. On the west, 3 miles 60 chains steep side hill.

Thence three miles 52.55 chains, to the ferry at Tunkhannock. Fall, 6 254 feet. Soil, on the east, 10 chains of ledges of loose rock, mixed with clay and gravel, and 74.95 chains of steep side hill; the residue alluvial. On the west, one mile 17 chains of side hill. Streams, upon the east, Tague's creek, up which there is one saw mill. On the west, one small rivulet.

Thence, 2 miles 51 chains. Fall, 3.886 feet. In this distance crossed the Susquehanna river, upon the west side—(benched an elm tree on the west bank of the river, 26.577 feet above the surface of the water.) Soil, upon the east, 30 chains of ledges, and 20 chains of steep side hill; residue alluvial. On the west, alluvial. Streams, on the east, Tunkhannock, which is a large stream, and rafts descend it about twenty-five miles; and one other small rivulet. On the west, Bowman's creek, a large stream, down which rafts descend about eight miles. It is about 6 perches wide.

Thence, 4 miles 28.096 chains. Fall, 13.95 feet. Soil, on the east, 75 chains of ledges, (Osterhout narrows,) and 18 chains of steep side hill. On the west, 28 chains of steep side hill; residue alluvial. Streams, on the east, one small creek and two rivulets. On the west, one small creek.

Thence, one mile 61.5 chains. Fall, 6.671 feet. Soil, on the east 30 chains of ledges, and 12 chains of steep side hill; the residue alluvial. On the west, 28 chains of steep side hill; the residue alluvial. Streams, on the east, none. On the west, Keeler's creek, which is a small mill stream.

Thence, 5 miles 15.7 chains. Fall, 7.790 feet. Soil, on the east, 32 chains of loose rock, which rise at an angle of about 40°, from the bank of the river, and 72 chains of steep side hill; residue of the distance alluvial. On the west, nine chains of ledges of loose rock, and one mile and 6.6 chains steep side hill. Streams, on the east, Buttermilk falls creek, which is a fine mill stream, and three small rivulets On the west, Swarthout's creek, which is a mill stream, and one rivulet.

Thence, 5 miles 67 chains. Fall, 12.518 feet. Soil, on the east, one mile 60 chains of ledges, and 70 chains of steep side hill. On the west, alluvial, with some rock. Streams, on the east Gardner's creek, a considerable mill stream, and two other small streams. On the west, Sutton's mill stream, and six small rivulets.

Thence, through Wyoming valley, 10 miles 19.4 chains, to Toby's Eddy, at Barne's coal mine. Fall, 21.69 feet. Soil, on the east, 42 chains, ledges of rock, and 10 chains of steep side hill; the residue alluvial. Streams, on the east, the Lackawanna

river, mill creek, and two small rivulets. On the west, Abraham's and Toby's creeks, and one small stream.

Thence, 5 miles 30.75 chains. Fall, 10.764 feet. Soil, on the east, 20 chains of rock, and 20 chains of side hill; residue alluvial. On the west, alluvial. Streams, on the east, three mill streams. On the west, two small mill streams.

Thence 4 miles, 70.1 chains. Fall, 6.987 feet. Soil, on the east, 58 chains side hill; residue alluvial. On the west 58 chains side hill; residue alluvial. Streams on the east, none. On the west, two fine mill streams, Harvey and Hunlock creeks.

Thence 5 miles 30 chains. Fall, 4.093 feet. Soil, on the east, one mile 15 chains of loose rock. On the west, alluvial—two short distances of side hill. Streams, on the east, none. On the west, one large mill stream and three rivulets.

Thence 8 miles 65.6 chains. Fall, 13.818 feet. Soil, on the east, 45 chains of large, loose rock, and 45 chains of steep side hill; the residue alluvial. On the west, 36 chains of rocky side hill, and the residue alluvial Streams, on the east, two fine mill streams, Big and Little Wapwalopin creeks, and one small rivulet. On the west, two mill streams and five rivulets.

Thence 2 miles 15.4 chains, (passing Nescopec falls.) Fall, 14.069 feet. Soil, on the east, alluvial. On the west, 38 chains of side hill; the residue alluvial. Streams, on the east, one large mill stream, (the Nescopec creek). On the west, none.

Thence six miles 21.9 chains. Fall, 9.389 feet. Soil, on the east, one mile and a half of steep side hill; residue alluvial. On the west, alluvial. Streams, on the east, Ten Mile run, which is a mill stream. On the west, Briar creek, which is a fine mill stream, and two small rivulets.

Thence 6 miles 46.8 chains, to Fishing creek. Fall 8.499 feet. Soil, on the east, one mile of rock, which is nearly perpendicular, and the residue steep side hill. On the west, alluvial. Streams, on the east, none. On the west, two small streams.

Thence, one mile, 32.4 chains. Fall 5.261 feet. Soil, on the east, alluvial. On the west, 8 chains of perpendicular rock, and 42 chains of steep side hill, the residue alluvial. Streams, on the east, one small stream. On the west, Fishing creek, which is a large fine stream, upon which are a great number of mills; and rafts descend 25 or 30 miles.

Thence, 9 miles, 63.35 chains, to a point about one mile below Danville. Fall 15.599 feet. Soil, on the east, one mile of ledges of rock, 55 chains of side hill, and the residue alluvial. On the west, 4 chains of rock, and 75 chains of steep side hill, the residue of the distance, alluvial. Streams, on the east, Cattawissa creek, which is a large mill stream, and three other creeks, each of considerable magnitude, viz. Big and little roaring creeks, and Logan's creek. On the west, the Mahoning, and three small rivulets.

Thence, 5 miles, 2.65 chains, to the head of Crook's ripple. Fall 2.44 feet. Soil, on the east, alluvial; on the west 33 chains of steep side hill, immediately below Danville; the residue of

the distance, alluvial. Streams, on the east, Gravel run, which is a mill stream: On the west three small streams.

Thence, 5 miles, 12.66 chains, to the West Branch of the Susquehanna river, at the town of Northumberland. Fall to the surface of water in the West Branch, 9.515 feet. Soil, on the east, 15 chains of rock, nearly perpendicular, and 25 chains of side hill; the residue of the distance alluvial On the west, alluvial. Streams, on the east, one small rivulet. On the west, one small mill stream.

The whole distance from the north line of Pennsylvania, on the Susquehanna river, to the West Branch, at the town of Northumberland, is 161 miles and 50 chains. Total fall, 337.093 feet. The distance from the north line of the state, upon the Chemung or Tioga river, to the West Branch at Northumberland, is 161 miles, 18 chains. Total fall 343.413 feet Upon the east side of the river, there are 11 miles, 76 chains of rock; part of which is perpendicular; and 26 miles and 56 chains of side hill, composed principally of loose rock, clay, and small gravel; the residue of the distance, 122 miles and 76 chains, is alluvial. On the west side, there are 7 miles and 19.9 chains of rock, part of which is perpendicular, and 20 miles 65.6 chains of steep side hill, composed principally of loose rock, clay, and small gravel; and 133 miles 12.5 chains, of alluvial ground. Streams, on the east side of the Susquehanna, the most considerable are the Wysox, Wyalusing, Tunkhannock, Lackawanna, Nescopec, and Cattawissa creeks, all of which are large fine streams, upon which numerous mills are erected, and down which rafts descend from 10 to 40 miles, and are generally about 6 perches wide, from bank to bank. There are 21 streams of less magnitude, viz. Romefield's, big and little Tuscarora creeks, Masophin, Buttermilk falls, Tague's, Osterhout's, Gardner's, Mill creek, Solomon's, Gearinger's, Nanticoke, Kister's, big and little Wapwalopin creeks, Ten mile run, big and little roaring creeks, Logah's run, and Gravel run; all of which, and one other, drive mills; and fifty small creeks and rivulets, many of which furnish valuable mill powers. Of the streams on the west side of the river, five are large, upon which mills are erected, and down which rafts descend several miles, viz. Sugar, Towandy, Mahoopeny, Bowman's, and Fishing creeks. There are 26 smaller streams, viz. Duval's, little Mahoopeny, Swarthout's, Sutton's, Abraham's, Toby's, Shupp's, Smith's, Harvey's, Hunlock's, Shickshinny, Beack's, Sybert's, and Brier creeks, and 12 others, names not known, all of which propel mills; and 58 still smaller streams and rivulets, many of which are sufficiently strong to drive mills for a considerable part of the year. The general average width of streams of the first class, is about six perches, from bank to bank; those of the second class, about four perches from bank to bank; and those of the third class, about two perches wide, from bank to bank.

The river itself, and most of its considerable tributaries, may be used as feeders to a canal. Stone, timber, and every material

for a canal, are found in abundance, contiguous to the river. Very little can be introduced into this report, which does not appear upon the accompanying drafts, profile, and minutes, to which I refer. The minutes will show the frequent benches made upon the line, and a glance at the maps, will show the counties, townships, villages, islands, mountains, streams, and the different kinds of soil, and the proportion of each upon each side of the river. It may not be improper to state, that the most intelligent portion of the people along the river manifested a strong desire that a canal should be constructed. A severe attack of billious fever contracted upon the river, whilst upon this service, and from which I am at this time scarcely recovered, is the only apology I can offer for the delay in making my report, dratts, &c., and for the imperfect manner in which they are executed. It is hoped, however, that if they do not meet the expectations of the board, they will at least be regarded, (as they are intended,) as a faithful detail of facts, as I have found them, without ornament or exaggeration; and that the principal objects of this survey and examination will be thereby attained.

All which is repectfully submitted.

JOHN BENNET.

No. 5.

Remarks on the North Branch survey, by Judge Scott, a member of the board.

To the board of canal commissioners of Pennsylvania.

In presenting to the board the report of Mr. Bennet, the undersigned begs leave to state, that immediately after the resolution of the board, of the 10th day of March last, appointing Dr. Patterson and the undersigned, a committee to superintend the examination and surveys of several unexplored routes for canals, mentioned in the act establishing a board of canal commissioners, it was agreed between Dr. Patterson and the undersigned, that the undersigned should superintend the survey of the route from the city of Philadelphia to the northern boundary of the state, and that Dr. Patterson should superintend the surveys of the other routes mentioned in the said resolution. This arrangement, it is believed, was made with the knowledge and by the consent of the board.

In pursuance of this arrangement, and a resolution of the board of the 9th day of May last, confining the examination and survey of the northern route to the valley of the Susquehanna, between Northumberland and the Northern boundary of the state, the undersigned, with the knowledge and approbation of the members of the board, engaged the services of John Bennet, Esq. of Luzerne

county, a practical surveyor of great experience, to head the exploring party.

Mr. Bennet made arrangements for the immediate commencement of the work; but in consequence of some difficulties in procuring the necessary instruments, and an unusual flood in the Susquehanna and its tributary streams, the operations of the party were necessarily delayed until the month of July. On the 15th of that month, Mr. Bennet proceeded with the undersigned to the vilage of Athens, in Bradford county, in the vicinity of the state line; and there, having made the necessary arrangements, the work was commenced.

As other official engagements must necessarily prevent the undersigned from continuing with the party for any considerable length of time, the undersigned drew up, and delivered to Mr. Bennet some general instructions for the regulation of his conduct, of which the following is a copy.

ATHENS, July 21, 1826.

JOHN BENNET, Esq.

SIR—In making the survey and examinations, and in taking the levels for a canal from the northern boundary of the state along the Susquehanna to Northumberland, you will commence upon the state line both upon the Susquehanna and Chemung rivers, and unite the levels at some convenient point at or near the village of Athens. You will then extend your line of levels to Northumberland

In taking the levels, you will not be confined to one side of the river, but you are at liberty to cross it when necessary, to avoid difficulties and facilitate the work.

Both sides of the river must be examined and the following particulars accurately noted.

1 *The soil.*—Whether composed of clay, sand, gravel, &c.

2. *The mountains and hills.*—Whether composed of rock, loose stones. slate, sand, gravel, &c.

3. The difficulties to be encountered in the construction of a canal, in consequence of the mountains, hills and high banks jutting into the river, and the length of such narrow passes.

4. The streams emptying into the river on each side—the width of their beds from bank to bank—whether they are navigable for rafts, &c. and for what distance, whether mills are erected on them, whether there is a failure of water at any season of the year to propel mills, and what streams can conveniently be used as feeders to a canal.

In short, you will examine and note every thing necessary to enable you to make a complete map of the river, the islands it contains, the mountains and hills adjacent, and a short section of each stream which empties into it, designating the difficulties and facilities on each side of the river in the construction of a canal.

The local names of the islands, falls, ripples, streams, mountains, hills, townships, villages, &c. should be ascertained and accurately written upon the map.

You will consult economy in all your expenses. Keep an accurate account of all disbursements; take a receipt for every considerable sum, (and in all cases where practicable,) which original account, with the receipts, must be produced upon the settlement of your accounts, verified by your oath.

Inform me weekly of the point at which you have arrived, and at the same time direct at what post-office I shall address you

Draw on me for the necessary funds when wanted.

DAVID SCOTT,
One of the canal commissioners of Pennsylvania.

In pursuance of these instructions, Mr. Bennet commenced and prosecuted the work, with great activity, diligence and zeal, and finished the survey and returned home on the 20th of September. Within a few days after his return, he was attacked with a billious fever, from which he has not yet entirely recovered. All the persons engaged under him, with one exception, were visited, about the same time, with the same disease, which, in every case, has been unusually protracted. The occurrence of this unfortunate circumstance, over which Mr. Bennet nor the undersigned, could have any possible control, will account for the delay in making his report, drafts, &c. and, it is hoped, will be received as a sufficient apology for any imperfections which may be found in their execution

The undersigned embraces this occasion briefly to present to the board his views upon the practicability, necessity and importance of a canal along the valley of the Susquehanna, and particularly from its intersection with the Pennsylvania canal, to the northern boundary of the state.

From the survey of Mr. Bennet, it is ascertained that the total distance from the northern line of the state upon the Tioga or Chemung river to Northumberland, is 161 miles 18 chains.
Total fall, 343.413 feet.
From the state line on the Susquehanna to
Northumberland, is 161 miles 5 chains.
Fall, 337.093 feet.

From the surveys already made, and from the geological structure of Pennsylvania, it is doubted whether there can be found within her limits, so great a distance, in so direct a line, requiring so little lockage. The average fall per mile, in the whole distance, is but a fraction more than two feet; and from the head of Wyoming valley to Northumberland, a distance of seventy-one miles, including the two principal falls upon this branch of the river, (the Nantecoke and Nescopeck,) the average fall per mile is a fraction less than one foot nine inches.

The Susquehanna and its tributaries afford abundant supplies of water; and, it is believed, they may be used at every desirable point, as feeders to a canal

From the report of Mr Bennet, it appears, that the proportion of rock excavation will be unusually small, when compared with

the distance on either side of the river ; and that the soil throughout the whole explored route, is principally alluvial, composed of clay, sand and some mixture of ground, in which clay predominates, is of a firm texture, and of easy excavation.

It is believed that few, if any, of the narrow passes, where the bases of the mountains or hills composed of rock, form the banks of the river, present greater difficulties in the construction of a canal, than are to be met with at Peter's, Short, and the Kittatinney mountains; and that no point upon the whole line presents impediments so formidable, as are found at Butler's falls, upon the Delaware, where the canal of the Hudson and Delaware company is now in successful progress.

Stone, timber, and every other material necessary in the construction of a canal, may be obtained in the vicinity of the line; and it is believed that very few instances would occur, where the value of the necessary ground, or damages for injuries sustained, would be demanded, except where a valuable building or mill power should be materially injured, or entirely destroyed.

If the undersigned is correct in his facts, or if, indeed, he approximates near the truth, the inference is clear, that a canal is not only practicable, but that it can be constructed at a comparatively small expense.

The necessity and importance of a canal along the valley of the Susquehanna, will appear from the following considerations.

One of the most striking features delineated upon the map of Pennsylvania, is the Susquehanna river and its great branches. Entering Pennsylvania, from the north, it passes nearly through its centre, and, with its tributaries, drains nearly one-half of the territory of the commonwealth. This portion of Pennsylvania is not surpassed by any other tract of country, of equal extent, in the union, for the productiveness of its soil, and for the variety, value and extent of its minerals. It contains, also, at least one-third of the whole population of the state.

A large tract of country, beyond our northern boundary, within the limits of the state of New York, rich in its vegetable and mineral products, and embracing a population of nearly two hundred thousand inhabitants, is also drained by the Susquehanna and its northern tributaries.

To the territory drained by this noble river, within the states of Pennsylvania and New York, containing above twenty thousand square miles, and a population of more than half a million, nature has pointed out the valley of the Susquehanna, as the great highway to market.

The Susquehanna is regarded as a navigable river. It is so, in a limited sense. Viewed in its whole extent, in connexion with its great branches, its ascending navigation is extremely limited and difficult; its descending navigation is uncertain and of short duration, and both are at all times hazardous. A voyage across the Atlantic does not involve so much dan-

ger to life and property, as the navigation of the river from Newtown, in the state of New York, to the head of tide. It is believed that the difficulties, delays, dangers and losses, which at present attend the navigation of this river, are little known, and less understood, except by those interested in the river trade.

Since the opening of the Erie canal, and the construction of turnpike roads from the Susquehanna to the valley of the Delaware, the Hudson and the lakes, the boats upon the Susquehanna, for the transportation of the ascending trade, have gradually disappeared, until not a single boat is found plying upon the river above Northumberland. It is found that merchandize can be transported, by waggons, from the city of Philadelphia, the city of New York, and the heads of the Seneca and Cayuga lakes, with more expedition, at less expense, and less hazard, than by the river.

The descending navigation of the Susquehanna is uncertain, of short duration, and at all times dangerous. Property can only be floated down in the time of high floods, which seldom occur, except in the breaking up of the ice, and the melting of the snow, in the spring season. During these floods, the river is not navigated with any degree of safety or success, if at all, for more than a week or ten days. The consequence is, that the whole trade of the Susquehanna descends at nearly the same time; the markets, which are at all times very uncertain, in the towns and villages along the river, are overstocked; the owners have incurred expenses which they cannot meet without sales, and they are frequently obliged to sell at a ruinous sacrifice.

It sometimes happens that there is no spring flood sufficient for the descending trade. When this is the case, great losses are sustained by the owners, not only in consequence of the embarrassments incident to dissappointments and a failure of market, but also on account of the deterioration, if not the entire destruction, of many articles, by the keeping. A summer flood, after the failure of a spring flood, generally proves ruinous. Being disappointed, and having property on hand, and anxious to get it to market, the owners embark it upon the summer flood. The water evaporates, the river falls, and with it all their hopes, before they reach a market. Indeed, very little property ever reached its intended destination by a summer flood.

Round and square timber, scantling, boards, and plank, are floated down in rafts. All other articles are floated down in arks, which, although they carry from forty to fifty tons each, are very frail vessels, and are liable to many destructive accidents.

The loss occasioned by accidents incident to the river navigation, exposure to the weather, &c. is estimated at five per cent. upon the gross amount of exports.

The whole amount of property which descended the Sus-

quehanna, last year, was estimated at four millions and a half. The tonnage required for the transportation of those articles which could not be floated in rafts, must have amounted to more than one hundred thousand tons. Fifteen hundred arks arrived at Port Deposit, and it is known that there were many, and it is fair to presume that at least five hundred, found a market for their lading, at the towns and villages along the river, above that place.

Estimating the loss incident to river navigation, at 5 per cent. which is certainly very low, and the amount of exports at four and a half millions, the gross amount of loss annually sustained, would be two hundred and twenty five thousand dollars. Besides this, there is, and must always continue to be, (whatever improvements may be made in the descending navigation,) an enormous sacrafice in the item of arks. An ark of sufficient capacity to carry forty or fifty tons, will cost at least sixty-five dollars. It never can re-ascend the river; and consequently must be sold for any price which can be obtained for it. The average price of an ark, at the place of destination, is fifteen dollars. The loss, then, upon two thousand arks, the estimated number which descended the river last year, and which is annually increasing, will amount to one hundred thousand dollars, which, added to the estimated loss by accident, exposure, &c, amounts to the enormous sum of three hundred and twenty-five thousand dollars,—a sum, it is believed, equal to the interest upon the capital necessary for canalling the Susquehanna, from the New York to the Maryland line. The whole of this sum, and other items of considerable magnitude, would be saved to the individuals interested, and consequently serve to increase the aggregate wealth of the state, by a canal navigation. The expenses of navigating an ark, of the common capacity, (forty or fifty tons,) from Wyoming valley to the head of tide, amount to 120 dollars. The transportation of the same tonnage, by canal boats, it is believed, would greatly diminish this item of expenditure.

The country above the Wyoming valley is supplied with merchandize from the city of New York. The surpluss products are floated down the river, sold, and the proceeds taken in cash by the merchants to New York, and there laid out in goods, which are transported by water to some point upon the Hudson; or, by the Erie canal to the head of the Seneca or Cayuga lake; and thence by waggons to the valley of the Susquehanna. Indeed, a considerable portion of the merchandise, at this time, vended in Luzerne county, is purchased in New York, and thence transported by waggons—the difference in the distance between Wilkesbarre and Philadelphia, and Wilkesbarre and New York, being very trifling. When a canal shall have been constructed along the valley of the Susquehanna, from the northern boundary of the state, to intersect the Pennsylvania canal, the whole country above that point will be supplied with merchandize from the city of Philadelphia, and most of the produce

of the country will find its way there to market. Until this is done, Philadelphia can never enjoy the trade of the Susquehanna. Hence, to the interest of the state in general, and to the city of Philadelphia in particular, the necessity and importance of this great improvement.

Of the two thousand arks, which descended the Susquehanna last year, at least fifteen hundred must have received their lading above Harrisburg. The lumber, which annually descends the river, is estimated at 175 millions of feet, the whole, or nearly the whole, of which, comes also from the country above Harrisburg. As before stated, the whole of this property nearly, in ordinary seasons, and in the present state of the river navigation, must arrive in the course of a week or ten days—and when arrived at this point, the principal part of the expenses will have been incurred; and the flood having borne it thus far, will quickly bear it further, and with trifling additional expense. Under these circumstances, it never can be expected that the trade of the Susquehanna will stop at any point where the Pennsylvania canal shall intersect the river—that the owners will unload, store, reload, and incur all the expense, vexation, and delay, incident to a trans-shipment to Philadelphia by the Union, or any other canal, connecting the Susquehanna and the Schuylkill or Delaware.

If there was a safe and easy ascending and descending navigation by canal, along the valley of the Susquehanna, the products of the country would not be hurried to market in the course of a few days, in the time of a high flood, in craft of unwieldy size and frail structure; but the season would be occupied in their transportation in boats which could pass through the Pennsylvania canal to Philadelphia; losses by accident and exposure would seldom or never occur; an immense saving would be made in the item of arks; the trade would annually and rapidly increase; the extensive forests of wild lands upon our northern border would be immediately settled and improved; towns, villages and manufactories would spring up along the line; an impulse would be given to industry and enterprise; the market would soon assume a fixed character; and it is believed that the whole region drained by the Susquehanna and its tributaries, above its intersection with the Pennsylvania canal, would be supplied with merchandise from the city of Philadelphia.

In the present state of the river, and after every thing shall have been done which can be done to improve the descending navgiation by the natural channel, the immense and increasing trade of the Susquehanna will continue to be, as it has hitherto been, divided between New York and Baltimore. Nothing can save it, (nor the other advantages before enumerated,) to the state, or divert it to Philadelphia, but a canal from the northern boundary of the state to the Pennsylvania canal, along the valley of the Susquehanna. It is certainly worth contending for, and if not secured, it will not be on account of any deficiency in facilities

or means. Of the first, nature has been liberal in her gifts; of the last, the state can furnish an abundance.

Another and a very important question presents itself in the examination of this subject. Is it probable that the annual tolls upon the proposed canal, will amount to the interest of the capital expended in its construction?

No estimate has been made of the expense; but from the report of Mr. Bennet, the average cost per mile may reasonably be estimated at eight thousand dollars. If the Pennsylvania canal should be located by the West Branch route, (the distance from the northern line of the state being one hundred and sixty-one miles,) the expense of constructing the canal would amount to $1,288,000. The annual interest of which will amount to $77,280. If the Juniata route should be adopted, the length of the canal would be increased to 197 miles, which, by the above estimate, will amount to 1,576,00. The annual interest of which will be $94,560.

Of the vegetable products of the Susquehanna valley, it is estimated that more than one third comes from the country above the West Branch, and at least two-thirds above the Juniata. This, in the present state of the river navigation, is annually increasing, and with the advantages of a canal navigation, would soon be more than doubled. In the exportation of the mineral products of the country, very little has, as yet, been done. Inconsiderable quantities of anthracite coal, from the Wyoming valley, have for several years past been floated down in arks; but the losses by accidents, and in the item of arks, have been so great, and the markets have been so uncertain along the river, as to deter capitalists from engaging extensively in the business.

The anthracite coal formation extends from the sources of the Lackawanna, along the valley of that stream to the Wyoming valley; thence through the Wyoming valley to the hills near Berwick, making together a distance of eighty miles. This coal tract is from half a mile to five miles wide, and is estimated at an average width of two miles; throughout the whole of which, coal is found in strata of from five to forty feet thick. Estimating the average thickness of the stratum of coal at twelve feet, (which is below the fact,) this region contains one thousand three hundred ninety-five millions eight hundred and seventy thousand tons of coal, which, with all the capital which could advantageously be invested in the business, and with all the facilities of canal navigation, could not be exhausted in ten thousand years.

It is believed that upon the construction of a canal, the exports of this mineral would soon amount to 50,000 tons annually, and would probably be increased to 100,000. Estimating the annual exports of coal from the Wyoming valley and the contiguous coal region, at 50,000 tons, and the toll at one cent per ton per mile, the tolls upon this mineral alone, to the Swatara, the distance of one hundred and nineteen miles, would annually amount to $59,500. The return tonnage by the coal boats, might fairly be estimated at one-fifth of the descending tonnage, which would increase the tolls upon the coal trade alone to $71,400, which,

with the tolls upon other articles of trade, would immediately amount to more than the interest upon the capital expended, and at no very distant day, enable the state to pay off the debt which must necessarily be contracted in the construction of the canal.

The foregoing facts and observations have been thrown together in great haste, without order or method; and it is frankly admitted that errors may be discovered in them; but it is insisted that they are generally correct; and that the more the subject is examined, the necessity and importance of a canal along the valley of the Susquehanna, will appear more strikingly clear and conclusive.

All which is respectfully submitted,

DAVID SCOTT,

One of the canal commissioners of Pennsylvania.

Harrisburg, Feb. 2d, 1827.

No. 6.

Report on the survey of the northern route, between the eastern and western waters, by James Geddes, Esq.

The directions received from the board of canal commissioners in April last, were:

"1. To ascertain the practicability of the proposed work, especially with reference to a supply of water on the summit level.

2. To obtained an accurate estimate of its probable expense.

3. To ascertain the several difficulties to be encountered and the most eligible means by which they may be overcome.

4. To have the line of the canal so located, that, if adopted hereafter, no further examinations may be necessary before its active commencement."

After locating a line of canal from the mouth of West creek, a tributary of the Driftwood branch of the Sinamahoning, to the mouth of the Juniata, one hundred and eighty miles; a general account of the region past over, was transmitted to the president of the board, in July last, in substance as follows:

The floods above Northumberland have been found to rise to a height, above what common report had made them, a serious obstacle to the making a canal in the river bed, where high rocky banks hinder the making it on shore, carrying the supporting walls to such an expensive height. While on the Sinamahoning, the flood-line of last spring was seldom found more than twelve feet above the then surface, but in a short distance below the mouth of that stream, the Susquehanna was found to rise nineteen feet above the surface, (twenty two or three feet above low water) and in many places still higher.

Another unlooked for character in the West branch, is there being *deep still water* at the foot of all the high rocky preci-

pices, which have their bases washed by the stream; throwing the canal consequently into the river bed. The stream here, has made its way along the valleys *among* the mountains, and not *across* their course as below Northumberland, and no rocks run across the bottom to the opposite shore. Where the river runs at the steep mountain's base, a section of the earth would show the same degree of steepness, below the water's surface, that is seen above it; the bottom being a formation from the disintegrated rocks above. At one place the wall to support a canal along the face of the rocks, would be based in water thirteen feet deep.† The depth of the water and height of the flood-line will, in some places, require a wall full thirty feet high.

Below Sunbury, a contrary feature is uniformly found to prevail; the river runs *across* the ranges of mountains, and having passed over low places in them, has carried away all that was soluble; the rocks remaining make rapids and shallow water opposite all the narrows.‡ This character of the Susquehanna continues not only to the mouth of Juniata, but to tide.

The favorable parts of the route present great regularity of surface. Gentle slopes, continuing long unbroken, except by some small ravines, scooped out by little rills, or a small swell to be cut through, where a mountain brook has dropped its alluvion, there is almost a total absence of that finger-formed surface, which is so troublesome to engineers, requiring continual calculations of *deep cuttings* and *embankings* between.

There will be little expense attending the construction of *feeders*, to supply, amply, all the levels. But the paying for mills, which must give up all their water, will be a considerable item.

A long embankment was found necessary to bring a level Pine creek, high enough for the passage of its floods under an aqueduct, and a serious deep cutting is to be passed through, in approaching Muncy creek.

The line of canal, as brought down through Northumberland, is, at that place, twenty-three and a half feet (from canal surface to river surface) above the level of the lowest water found by Mr. Wilson, the autumn preceding; and a level still eight feet higher, can be brought to said place, interfering but little with the village property, thus affording ample elevation for an aqueduct over the West Branch. The width of the stream here is thirteen hundred feet.

At the mouth of Juniata, by carrying the canal on Duncan's island, a level. 24.24 feet above the river surface, (full 26 feet above low water,) is obtained, with a supply of water from

† Canal banks in the Mohawk river, state of New York, are in some places based in water ten, and even fifteen feet, but the floods do not rise high.

‡ The term "narrows" is used for the contracted space between a steep rocky mountain and the river.

the river, taken in at Berry's falls, so that an aqueduct over the Susquehanna here, is practicable, if the width of the river (2350 feet) did not forbid.

Hon. JOHN SERGEANT, &c.

In the latter end of August, after examinations had been made, by running levels and guaging streams, in Elk creek valley, and the valley of the Clarion river, the following report, with a map, (see the latter end of the atlas,) was made to the president of the board of canal commissioners.

Examinations of the Sinamahoning and Clarion summit.

The product of the streams guaged is as follows:

STREAMS GUAGED,	IN 1825. *cub. ft. in 24 h.*	IN 1826. *c. f. in 24 h.*
Upper fork of Clarion,	614,400	537,120
N. E. fork of do.	471,460	402,336
Elk lick run,	164,861	17,280
S. E. branch of Elk creek,	204,972	Kersey feeder, 62,178
Kersey run, below Carr's run,	75,427	73,267
East fork of Elk creek, called north fork on map,	125,649	41,904
West creek, (Sinamahoning water,	113,842	24,480
	1,770,611	1,158,565
Deduct, as now not worth making, the Kersey feeder,		135,445
The remainder is		1,023,120

But to 1,023,120, add 145,312, the product of six small streams, not guaged last year, and the amount is 1,168,432 cubic feet per 24 hours

The very serpentine course which a level line pursues down Elk creek, and up the Clarion valley, (see the map,) will lengthen the feeder and canal to more than 40 miles,† exclusive of the Kersey feeder rejected.

Mr. Wilson's account of the forks of the Clarion is, that there can be but little descent given to the feeder along that valley; therefore the area of a cross section of the feeder must nearly equal that of a canal, as almost all the water to be had, is to pass through a channel the most tortuous, perhaps, that was ever projected.

But the very steep sloping surface, upon which the whole line of canal and feeder must run, from the west end of the proposed tunnel to the termination of the feeder in the Clarion, is of the most appalling nature. The work is to *hang* as it

† Counting along the feeder and canal, from the mouth of Elk creek to a N. W. branch of West creek, the two points where the first additional supply of water can be had.

were, on the face of a mountain, the angle from 15 to 30 degrees, and in some places steeper than the slope given to canal banks, indespensably requiring the work to be supported by wood or stone. The difficulty of conducting a water tight channel along the face of such a steep, will imperiously demand that much allowance be made for unavoidable leakage. The water passes horizontally but a short distance through the ground, until it reaches the surface of the bank, a surface which, in all the Elk creek valley, receives the direct rays of the meridian sun.

There are likewise many spots of stony surface, some of them requiring that earth be carried to them, to make a water tight work.

Take 41 miles of canal and feeder, the feeder exposed to nearly the same waste of water with the canal, and the quantity that is found, falls short of twenty cubic feet per mile, per minute.†

That the quantity found, would have been the same, had all the streams been guaged on Friday last, (Aug. 25th) there is no probability. The Elk creek streams were guaged on the 9th, 10th, and 11th Aug. and from Friday the 18th, to Friday the 25th, the water in the mouth of Elk creek appeared to have diminished more than one half in said week. A stone that was sunk in the Clarion river, at the mouth of Elk creek, for the purpose of observing the fall of the water, was left dry in the course of said week; shewing evidently that a considerable diminution had taken place, although a heavy shower had fallen in the fore part of said week.

A history of the weather this season, will show that it could not have been one of extreme drought. The earliest settlers had never seen the Clarion river so high at the mouth of Elk creek, as it was raised by the late June and July flood. Every little branch had overflowed its banks, where there still remains the prostrate fern and other herbage borne down by the overflowing flood. Showry weather continued to the end of July. On the 31st there was a rain of sixteen hours duration, only ten days before the guaging was commenced.

Such sudden shrinking of these streams can be accounted for, only by considering the particular formation of the surface.—The part of the country most elevated, may be viewed as *table land*, suited to receive the rains and give out durable water: but the proportion of this to the steep mountains, of solid sand rock, is so inconsiderable, that the rain sliding from their shel-

† In Mr. Sullivan's *Illustrations* of the report of the U. S. engineers, to the President of the U. S. made Feb 24, 1825, page 79, it is observed "Canals in England, being in a very different climate, do not, in regard to water, afford data on which fully to rely. The canals of France, whose climate most resembles that of the middle states, differ greatly from each other. The mean of these and of the best section of the Erie canal, together, is a near approximation to the truth.—*Evaporation* and *filtration*, above 58.13 cubic feet per mile, per minute."

ving sides, gives the mountain torrent, where in a few days nothing will be found but dry channels.

In examining further the capability of this country to continue to afford durable water, it is worthy of note, that at the head of almost all the lateral valleys which supply the water to the Elk creek and Clarion river, there is a soil, which would soon be cultivated, if the canal here proposed, was made; and when the time arrives that these brooks shall yield nothing but the drainage of fields entirely stripped of their woody covering, what proportion of their present discharge would they then give? Or should a rage for irrigation possess the proprietors of these grounds, the question may be asked, would any water arrive at and run through the proposed tunnel, in a dry time?

Through the country generally, last season was remarked as one of uncommon drought, and many were prepared to hope, that double the quantity of water would be found, that was reported last year. Favorable situations for reservoirs, it was expected, would be found, but a dam raised twenty feet high at the head of any of these valleys, would make but few acres of reservoir. so rapid is their descent.

Thus viewed, I do not hesitate in the opinion, that this summit would not have an adequate supply of water.

Very respectfully, I am, Sir,

Your most obedient servant,

JAMES GEDDES, Engineer.

Hon. John Sergeant, *President of the board of Pa. canal comm'rs.*

Philadelphia, August 31*st*, 1826.

Directed by the board, December 7th, 1826, in relation to the above summit, to *report* "such other facts and observations, as may be necessary to make the subject fully understood."

Additional Report on the Clarion and Sinamahoning summit.

The whole length of the Clarion feeder, from a point where the water is proposed to be received, to the line of canal in Elk creek valley, is 29¼ miles. The length of canal from where it strikes Elk creek, to the mouth of the north branch of West creek, is 19 miles; so that the feeder, and that part of the canal which has no other water, than the supply thrown into the summit level, make together, 48½ miles. In the above report, it was called 40 miles. The quantity of water found, 1,168,462 cubic feet per day, is equal to 811 cubic feet per minute, which divided by 41 miles, made not quite 20 cubic feet per mile, per minute. Divide 811 by 48½, the length now found, and the supply is not quite seventeen cubic feet, per mile, per minute.

The lockage on the Elk creek side of the summit, is 214.60 feet, near 36 *six-feet* locks, to the point where the line enters Elk creek. On the West-creek side, the lockage to the mouth

of its North Branch, is 172.12 feet, making 28 *six feet* locks, + 4.42 feet; together 387 feet lockage, ascending and descending, between the two points at which any addition can be had to the summit water.

The Kersey feeder is rejected, because it was found, measuring on its meanders, to be *seven* miles long, running near the whole distance on the faces of very steep slopes, so unfavourable to the making a tight water course, that it was not at all probable any of its water could, in a dry time, reach the canal, but would be all lost in *leakage*, *soakage*, and *evaporation*, before so small a quantity would run so great a distance. The discharge into the Kersey feeder is 135,445 cubic feet per 24 hours, equal to 94 cubic feet per minute, divided by 7 miles, gives not quite 13½ cubic feet, per mile, per minute—far short of a supply required for *filtration* and *evaporation*.

That part to be furnished by the Clarion, is 939,456 cubic feet, per day, or *nine elevenths* of the whole supply as guaged, which nine elevenths must run 46 miles, through feeder and canal, before it discharges itself into the lock at the mouth of the north branch of West creek, where the first new supply can be received on that side of the summit.

Considering the very unfavorable surface for making a water-tight canal, it is questionable whether *any* quantity of water that the upper end of the *feeder* could receive, would reach through said 46 miles, without much descent, and great enlargement of the cross-section on the upper part of the feeder.

But the whole distance upon which the summit water would waste, is 48½ miles. Calculating with Mr. Sullivan, that 58.13 cubic feet, per mile, per minute, should be allowed for *filtration* and *evaporation*, the whole quantity required for said waste would be $48.5 \times 58.13 = 2819.3$ cubic feet per minute; but the quantity found by guaging, is 811 cubic feet per minute, less than ⅓ of what he requires for *waste*—lockage water out of the question.

After this view, it would be useless to enter into any calculation of the *expense* of making the canal and feeder, or tunnel; or the cost of a mile of canal, on the face of a mountain, so steep as to require the removal of 240,000 cubic yards per mile, and very many such miles there are.

SUSQUEHANNA VALLEY.

Directions from the board of canal commissioners, dated December 7th, 1826, require: "A detailed result of the examinations from the mouth of *Juniata* to the mouth of *West creek*, accompanied with the requisite draughts, profiles, estimates, &c."

Considering the important products of the Bald Eagle valley, it may be very reasonably expected, that a communication by canal, with that valley, will be made, although the Juniata route to Pittsburg, should be chosen. Under such impressions, a *report*

on the line run from opposite the mouth of the Bald Eagle creek to the mouth of Juniata, is made separate from the upper division between Bald Eagle and West creek, and in a manner somewhat more particular, as said upper division, should the Juniata route be taken, would never be made.

SUSQUEHANNA VALLEY.—*Lower division.*

In making the following estimates of the cost of each mile, calculations are made on *excavation*, *embanking*, *aqueducts*, and *bridges*—feeders at the end of the mile where they are brought in. A sum for waste-weirs and fencing, will be added at a rate per mile—lockage at a sum per foot.

The Susquehanna valley, lower division, begins opposite to the mouth of Bald Eagle creek, thence to Northumberland, thence over the West Branch, and along the west side of the river to the mouth of Juniata.

ESTIMATES—LOWER DIVISION.

	DOLLS.		DOLLS.
1st mile, *		Lycoming feeder	1,287
2d,	10,224	27th,	6,947
3d,	4,800	28th,	5,020
4th,	6,708	29th,	6,107
5th,	5,563	30th,	7,429
6th,	5,400	31st,	5,345
7th,	5,100	32d,	8,360
8th,	6,794	33d,	6,120
9th,	3,404	34th,	14,480
10th,	16,339	35th,	7,740
Pine cr. feeder,	26,654	36th,	4,444
11th,	3,300	37th,	9,500
12th,	4,220	38th,	11,589
13th,	6,918	39th,	28,658
14th,	11,713	40th,	12,006
15th,	60,538	Muncy cr. feeder,	2,000
Larry's cr. feeder,	2,500	41st,	17,544
16th,	65,783	42d,	5,880
17th,	3,040	43d,	18,097
18th,	3,805	44th,	7,842
19th,	5,100	45th,	42,656
20th,	12,179	46th,	62,514
21st,	20,921	47th,	4,497
22d,	4,534	48th,	4,531
23d,	4,657	49th,	4,900
24th,	3,969	50th,	4,052
25th,	8,369	51st,	5,841
26th,	6,832	52d,	4,168

* Ought to be in the upper division.

	DOLLS.		DOLLS.
53d mile,	6,560	81st,	8,103
54th,	8,434	82d,	3,955
55th,	6,072	83d,	5,259
56th,	7,670	84th,	5,006
Muddy cr. feeder,	3,300	85th,	6,259
57th,	4,620	86th,	5,152
58th,	5,084	87th,	5,985
59th,	4,520	88th,	6,580
60th,	4,020	Mahantongo fr.	4,740
61st,	4,970	89th,	5,295
62d,	5,490	90th,	7,040
63d,	5,127	91st,	3,868
64th,	9,400	92d,	4,044
65th,	5,102	93d,	4,812
66th,	6,646	Feeder,	500
67th,	3,868	94th,	7,190
68th,	4,420	95th,	4,420
69th,	9,600	96th,	4,430
70th,	22,089	Feeder from Berry's falls,	5,940
71st,	5,793	97th,	5,720
72d,	4,368	98th,	5,460
73d,	4,932	99th,	18,436
74th,	10,884	100th,	8,138
Penn's cr. feeder,	7,004	101st,	5,269
75th,	4,120	102d,	4,308
76th,	4,772	103d,	5,220
Middle cr. feeder,	2,000	104th,	27,613
77th,	10,359	105th,	3,920
78th,	9,536	106th,	4,439
79th,	8,620	385 yds. of 107,	770
80th,	5,640		

Amount of the 106+ miles, &c. $ 1,031,804

LOCKAGE.

LOCKS.		FEET.
2,	from the mouth of Bald Eagle *up* to Pine creek level,	16.25
14,	from Pine creek level *down* to the river surface, at Northumberland,	118.50
2,	from Northumberland *up* to Penn's creek level,	16
12,	from Penn's creek level *down* to the mouth of Juniata,	104.25
30		255.00

The extra lockage is

At the upper end, 16.25 *up*, ⋈ 16.25 *down* to said level again.

At Northumberland 16 *down* ⋈ 16 *up* to Penn's creek level, together, 64.50

Leaving the fall from Bald Eagle to Juniata, 190.50

Several miles will not need fencing on either side, and a part but on one side. Two hundred miles of fence will be near the length required. At 75 cents per perch, one mile is 240 dollars.

Waste weirs will be required, one on each level, and for three long levels let three more be added; together thirty-one. They may be made sufficiently large for one hundred and fifty dollars each.

RECAPITULATION.

Estimates of the excavation, &c. of 106 miles,	$1,031,804
Lockage, two hundred and fifty-five feet, at $150,†	38,250
Two hundred miles of fence, at $240 per mile,	48,000
Waste weirs, thirty-one, at $150 each,	4,600
For water rights, put at	54,000
Aggregate,	1,176,654
Add 10 per cent for contingencies, superintendance and engineers,	117,665
The sum total is	$1,294,319

As the above estimates are made, there is but 3,000 dollars put down for crossing the West Branch at Northumberland. The sum is for erecting three piers, for taking boats across by what would be called a rope ferry, postponing for the present, the consideration of an aqueduct or towing path bridge.

The plan of rising from the river on the west side by two *eight feet* locks, is to be accomplished by making a new summit, to be supplied by Penn's creek as a feeder. When the purchase of water rights at Penn's creek (two valuable grist mills and a forge,) is counted, adding the cost of thirty-two feet of lockage that would be saved; it is doubtful whether much additional cost would accrue by substituting an aqueduct. The *first* cost of four locks is readily ascertained, but the expense of repairs and attendance, ever after, would doubtless be estimated differently by different calculators. At present the cost of the water rights is difficult to fix. But a more important consideration remains: whether the whole water of Penn's creek would at all times supply the summit proposed? Should it, at a suitable season for examination, be found insufficient, the aqueduct will be indispensable. A calculation more satisfactory will be made by those who shall hereafter be in possession of better data. That the navigation would be more perfect with an aqueduct, all will agree.

† The *breast*, upper *wing-walls*, and *hollow quoins* stone, the sides and foundation wood.

Susquehanna slack-water navigation.

Instructions of the president, afterwards enjoined by the board of commissioners:

"We shall wish, at some time, to have a fuller exposition of your views, as to the practicability and advantages of an improvement of the Susquehanna by a *slack-water* navigation. You will please, therefore, to give your attention to this subject as occasion may offer, so that you may be enabled to give us detailed information as to the mode, expense, &c"

The view of the Susquehanna valley, that has been taken, shows that little would be gained by substituting a *slack-water* navigation for a canal The proportion of the low alluvial lands, composing these shores forbid the constructing of any other dams on the river, than very low ones, the consequence of which would be that the locks and dams would be very numerous. The towing-paths would be often under water, unless raised to an expensive and inconvenient height.

The most expensive piece along the river, is here noticed. It begins on the west side of Larry's creek, with the fifteenth mile, (lower division, map No. 2,) and continuing to the end of the sixteenth, two miles are included, the most costly and difficult to make safe, of any equal distance on this part of the river. The instability of a wall just below the mouth of Larry's creek may be apprehended. In this place the *rapidity* and *direction* of the current above, throws the floods so furiously against the high rocks, along the face of which the canal must be conducted, that the most substantial masonry will be required for its protection. A wall must be carried, where the water is deepest, to the height of thirty feet, to be above the floods which rise very high at this place. Heavy stones, well fitted together, must be used, and such stones are not readily procured here.

The expense of the aqueduct and heavy embankment in the valley of Larry's creek, with these massive walls, puts the cost of these two miles, above any other like distance. Their amount in the estimates made, is $126,321, exclusive of the lock.

To pass these two miles in the river, two extra locks and a dam would be required. The lift of the lower lock must be great unless the dam is raised, higher, perhaps, than the low grounds on the river above, will admit; then the whole supply of water, to lock up, out of the river, into the canal, must be raised with machinery by the water power afforded at the dam.

When the sum is ascertained, that would be expended on this two miles of *river navigation*, with the addition of the sum that *ought* to be expended to avoid this increase of the lockage, with the continued expense of repairs and attendance, which the water-works would require, and the superior excellence of the canal, over the river navigation, are all considered, it is questionable whether any alteration ought to be attempted. However, a view of this place for the particular examination of said alteration, might present it in a different aspect.

As the river, for seven miles below, has scarce any fall, the water cannot be drawn from a dam at this place, without enormous expense of heavy extra banks, for a long distance, to keep the floods out of the canal. On this long level of the river, the floods rise very high.

A departure from the line run, by passing *Muncy hill*, in the river, deserves particular examination.

At Muncy hill the river surface, is 20.32 feet below the canal surface, as the line is run past said hill. Raise the river by a dam, 4.32 feet high, and it will exactly correspond with the level in Milton village. Let said level extend up to the dam, and the river water will enter, and pass through Milton, without an intervening lock. Give this piece of canal a descent of four inches per mile, and there will be still remaining at Milton, (according to Mr. Wilson's level of the preceding season,) a fall of 24 feet, from the canal to the river, on which, all *spare water* might be used at this place. Continue the canal with the same descent per mile, without a lock to opposite Lewisburg, where two *eight feet* locks may be placed, and a fall of sixteen feet is here obtained for the *spare water*, still undisposed of. Mills would be worth much at this place, opposite the Lewisburg bridge, and turnpike from Penn's valley. The same water, passing into the canal again, runs on to Northumberland, to be used once more upon a fall of sixteen feet: the canal still calculated to continue with the same descent, of four inches per mile. Let the depth of the water, from the dam to Milton, be five feet, surface, 40 feet, bottom, 25 feet, and the area of the cross section, will be 162.5 superficial feet. The velocity of a medium current, in such a canal, calculated by Eytelwein's formulæ, is 17.8+ inches per second, equal 86.5+ feet per minute, multiplied into the area, (162.5 feet,) yields 14.056+ cubic feet per minute. The quantity of water, thus drawn through the canal, over what will be required for lockage, will be very valuable at all the three points above mentioned. From Milton to Northumberland, 4½ feet depth may convey the water remaining.

The current in this canal above Milton would be nearly at the rate of a mile an hour (1730+ yards,) which would accelerate the descending trade but retard that ascending. If they were equal to each other, the advantage and disadvantage would be balanced; but as the descending trade would many times exceed the ascending, the current would be beneficial: over seven feet of lockage is likewise saved in the 22 miles from Muncy hill to Northumberland, by the proposed descent.

By a comparison of the difference in expense of the two routes, taking into consideration the value of water rights, that might be disposed of, and of water rights the purchase of which would be dispensed with,† (the river water being taken,) and the sum saved

† There would be the Muncy creek factory, Muddy creek, Limestone run and Chillisquaque mills.

by passing Muncy hill with a towing path instead of a canal, and contrast them with the cost of a guard lock and a lock to pass the river boats by the dam, with the cost of extra banks to keep out the river floods, and there appears a difference in favor of the alteration of more than one hundred and twenty thousand dollars, to the saving of which sum, nothing can be objected, but that the passage along Muncy hill, in flood time, will not be equal to the navigation of a canal.

Another piece of *river navigation* proposed.

From Northumberland to Shamokin ripples, the river might be used, saving the *thirty two feet* of lockage incurred by passing over Penns' creek summit, likewise the purchase of water rights on Penns' creek and Middle creek, with the cost of these feeders and aqueducts. The plan as follows:

Raise a dam at the Shamokin ripples five feet high, which would raise the water at Northumberland point two and a half feet. From opposite Northumberland carry a mound in the river parallel with the shore 1½ miles down to the dam, and a towing path on shore. The mound carried to, or near the surface of the river floods, would protect from waves the deep laden canal boats. From the dam through a guard lock, let the canal follow down the river shore. The fall of the river below Shamokin ripples, is such that in less than a mile from said dam, extra banking to keep out the floods, would be at an end. At Penns' creek, a lock of *six and a half* feet, would let the canal down to the level which passes M'Kee's falls. A level lower than this would deepen the rock cutting at and above said falls, and therefore inadmissible. As some descent ought to be given to bring the water from the river through said piece of canal, the lock would be less than 6½ feet. Penn's creek would be made to correspond with said level, by raising the two dams belonging to the Selins Grove mills† a foot or so. Middle creek would be crossed by a dam level with the paper mill dam. The water from said works, must be passed in a deep tail race through a culvert under the canal. A guard lock on each side, to pass the creeks when flooded, will be necessary both at Penn's creek and at Middle creek.

But, should Penn's creek prove insufficient to supply a summit, which is somewhat probable, and make the necessity for the aqueduct absolute, then the two routes may be compared as follow:

If an aqueduct 800 feet long over Allegheny costs $70,000, one at Northumberland 1,300 feet long may cost double that sum, the difference between the two places, in procuring good stone, being very great.

† See map No. 8, lower division.

Aqueduct over the west branch,		$ 140,000
Aqueducts at Penn's creek and Middle creek are, in the estimates at		4,500
Put the sum saved by using the river instead of a canal, for the 1½ miles above mentioned,		10,000
And the amount is,		$154,500
Against which is to be set off the dams and four guard locks (without walled chambers) at Penn's creek and Middle creek, with the deepened tail race at the paper mill, which may cost together,	8,500	
The extra banks to be given the canal below Shamokin ripples,	3,000	
		11,500
The saving,		$143,000

As the dam at Shamokin ripples would cost less than the water rights at said dam would be worth, nothing is set down for that item.

From the *aggregate* in page sixteenth,	$1,076,654
Subtract the two sums above proposed to be saved,	263,000
And the remainder will be,	$913,654
Add 10 per cent for contingencies, superintendance and engineers,	91,365
And the amount is	$1,005,019

Which sum being divided by 106 miles, makes $9,481+ per mile.

UPPER DIVISION.

From West Creek to Bald Eagle.

West creek may be considered as entering the Drift wood branch of the Sinamahoning, at the west side of the *range* of Alleghany mountains, although the ground dividing the Eastern from the Western waters is fifteen miles still further west and the river may be viewed as having past through the Alleghany *range* at Queen's Run, having ran, as measured on the canal line, a distance of seventy one miles. The stream little exceeds the length of the canal line.

From West creek to Queen's run the whole valley, is deep among the mountains. This stream passing in contracted vales or through narrow defiles, at the feet of towering eminences, has not in all this distance, any falls or considerable rapids. In the whole of said distance through these mountains, there is not found forming the bottom across the stream any rock in *lace*. At a time of extreme low water, an emigrant to the state of Ohio, cut a passage for his canoe with his hoe through every rapid to the mouth of the Portage branch, at the head

of which branch a brook of the Allegheny was turned down to the Susquehanna a few years ago.

Margins of arable land bosomed among the mountains are found along the stream, sometimes very narrow, but seldom too narrow, or too circumscribed for the adventurous mountaineer to set a house on. Instead of roads, they on the water with their canoes, convey every thing. If a wagon is found on some of the best farms, it was brought there by water and is destined to move only on the ground of the owner, or perhaps to his next neighbour. A pack horse path has been made through the whole of this seventy one miles, and the canal line is run on the same side, always crossing the stream with the path. At very many of the narrows, the same side of the stream cannot be occupied by both the road and canal; a width for both would fill up the whole water course. A canal being made here a road, and one for carriages too, would be indispensible, and it must be made on the opposite side from the canal, and at a great expense.

In the first eighteen miles below the mouth of West creek, the canal line crosses on the surface of the stream, above dams nine times, the crossing above the mouth of West creek is, by an aqueduct. The continual crossing the stream on its surface, makes a navigation not equal to an uninterrupted canal. Very high floods have risen, in one night; the rapid current thus produced, would stop the navigation for a day or two, while the flood subsided.

Considering the imperfection of this navigation, thus liable to delays and even dangers, and the money saved by dispensing with the dams, guard-locks and towing path bridges, it is questionable whether a canal made altogether on the left bank, ought not to be preferred. A canal carried past the several narrows by walling in the bed of the stream, would lesson the water-way, throw the floods more on the land, besides raising them higher. But as the floods do not rise high on the Sinamahoning, nor is the water deep, the expense of walling in the stream would be much less than on the Susquehanna, where the floods and depth of water is greater.

ESTIMATES.—UPPER DIVISION.

	DOLLS.		DOLLS.
1st mile,	9,080	11,	4,060
2,	6,300	12,	6,451
3,	5,300	13,	6,874
4,	7,157	14,	5,100
5,	4,360	15,	8,160
6,	4,360	16,	5,100
7,	6,413	17,	6,380
8,	6,851	18,	6,385
9,	6,551	19,	6,069
10,	6,127	20,	15,213

Estimate continued.

	DOLLS.		DOLLS.
21,	7,718	47,	6,038
22,	9,736	48,	17,187
23,	6,647	49,	10,584
24,	14,655	50,	7,170
25,	5,489	51,	19,625
26,	27,775	52,	9,856
27,	5,540	53,	8,525
28,	8,806	54,	5,900
29,	13,087	55,	25,520
30,	15,382	56,	11,787
31,	5,500	57,	22,157
32,	12,177	58,	31,295
33,	15,050	59,	5,079
34,	15,767	60,	26,825
Susquehanna West Branch.		61,	5,257
35,	3,584	62,	39,406
36,	32,912	63,	5,800
37,	21,453	64,	12,246
38,	4,735	65,	5,648
39,	4,606	66,	4,284
40,	4,600	67,	17,270
41,	9,001	68,	20,658
Kettle creek feeder,	2,000	69,	31,889
42,	31,450	70,	20,395
43,	47,300	Queen's r. feeder,	1,000
44,	7,060	71,	16,829
45,	26,620	72,	6,501
46,	6,492	73,	4,672
		74.	8,972
			$ 905,803
Add, for a mile further,			26,654
Amount,			$ 932,457

The above estimates from the mouth of West creek, on the Driftwood branch of the Sinamahoning river, to the Bald Eagle, giving the cost per mile, are for *excavation, embanking, aqueducts, culverts, and bridges,* and the several *feeders;* the cost of *fencing, waste-weirs,* and *lockage,* to be added.

RECAPITULATION.

The whole *lockage*, from a dam to be raised on West creek, to the Pine creek level, is 498 feet, at 150,	$92,700
There are sixty locks. A *waste-weir* to each level, is 60, at 150 each,	9,000
Fencing. These 74 miles may require one hundred miles of fence, which at 240 per mile, is	24,000
	$119,700
Amount of the estimates per mile, is	932,457
	$1,052,157
The purchase of water-rights,	6,000
Seventy-four miles of road to be made,	148,000
Amount,	$1,206,157
Add 10 per cent. for contingencies, superintendance, and engineers,	120,615
Total,	$1,326,772

Divide this total sum of $1,326,772, by 75 miles, and the cost per mile is $17,690.

I am, gentlemen, your most obedient servant, and respectfully submit the above.

JAS. GEDDES, Engineer.

The Board of the Pennsylvania canal commissioners.

Harrisburg, January 26th, 1827.

1st No. 7.

Reports on the survey of the Juniata route, by Canvass White, and George T. Olmstead, Esq.

To the Board of Pennsylvania Canal Commissioners.

GENTLEMEN,

The contemplated communication between the Susquehanna & Allegheny rivers, by means of canals and railway, has been examined with the aid of Mr. G. T. Olmstead, assistant engineer, as far as the head waters of the Juniata river. Indisposition prevented my accompanying the party any farther. The work was continued by Mr Olmstead, my principal assistant; his maps and report will give a correct view of the country, and an estimate of the expense for constructing a canal from Johnstown to the Allegheny canal feeder. Previous to my indisposition, I made a partial examination of the country over which the railway must pass, and

from the general appearance, I think the ground is favorably situated, considering the formidable barrier interposed between the eastern and western waters. A good turnpike road would probably answer all the purposes of transportation for several years, and a part of the bed could be occupied by the railway, whenever the business should require its construction. I would suggest the idea of making the canal boats in three or four pieces, to be divided transversely, and transported over the portage without changing the cargo.

The exploration for the canal was commenced on the west bank of the Susquehanna, below Sherman's creek, for the purpose of passing the river with an aqueduct; the line was carried along the valley of the river to the mouth of the Juniata, thence up the south bank of that river, several miles, but the country was found to be unfavorable. The surface of the river, above the falls, was assumed for the top water line, and the examination was then commenced at the east end of Duncan's island, where the Susquehanna is more than a thousand feet narrower than the point proposed for crossing below Sherman's creek. Two locks have been located at the end of the island, of 10 feet lift each, but are not numbered with the other locks along the line, not having determined the mode of crossing the river. I should propose passing it by means of a low dam from Duncan's island, or below Clark's ferry, at the upper reef of Foster's falls, which can be so constructed, as not to interfere with the navigation of the river. If the dam should be raised four feet, it will make the two first locks 8 feet lift each. My views on this subject have heretofore been laid before the board. If an aqueduct should be adopted, the line of canal from the falls, about five miles, must be raised, which will very much increase the expense; the bottom of the canal being but 16 feet above low water, will not be sufficient to pass the ice, floods and drift wood. The aqueduct must be made sufficiently wide to allow boats to pass each other, in order to avoid delays, which must otherwise occur, in consequence of the great length of the aqueduct. From Duncan's island, the country is generally favorable for the construction of a canal, on the left or north bank of the river, although the shores are in many places rocky, but do not present any very formidable difficulties. All the materials for the work can be conveniently procured, except stone, for locks, that can be cut; the stone along the river are too hard for the chissel. Hydraulic cement has not been found convenient to the line. Locks may be so constructed with wood and rough stone, as to be durable and easily repaired: the expense will be much less than stone locks. It should however be borne in mind, that great public works should be constructed in the most substantial manner; and wherever the nature of the case requires the use of timber exposed to decay, the work should be so planned as to be repaired during the winter season, thereby avoiding delays in the navigation.

An estimate of the expense for constructing a canal 28 feet bottom, 40 feet surface of water, and 4 feet deep, is made for every mile as near as circumstances will permit. Some deviation from the line, as laid down on the maps, may be made; but the general line cannot be deviated from much; the location of the locks may also be changed, probably for the better, in some places.

The line when laid out for actual construction, will undoubtedly vary considerably in the amount of excavation and embankment; some miles will require more and some less, but, in the whole, may not vary materially. The locks are all 8 feet lift, except the last one, near the west end, which is 6 feet lift; and, if built with wood and rough stone, they may be estimated at $1,500; but if built with stone, laid in hydraulic cement, they should be estimated at $1,000 per foot lift. The ground is generally favorable for the location of the locks; for no expensive rock excavation will be found necessary for the pits, although many will be founded on rock.

In estimating the expense of the aqueducts, they are calculated to be constructed with stone abutments and piers, with wooden superstructures—the culverts to be of stone laid in cement. The number of bridges, as near as could be ascertained, have been noted, and amount to about eighty; more will undoubtedly be found necessary, during the progress of the work; they are estimated at 200 dollars each—to be built with stone abutments and wood superstructures. The quantity of fence, necessary for the protection of farms through which the canal must pass, has not been ascertained, but probably will not amount to more than two-thirds of the whole distance, for both sides, and is estimated at 75 cents per perch. Feeders can be taken from the river, at convenient points, but could not be judiciously located without reviewing the ground, which time would not permit. I shall therefore put down this item at 50,000 dollars, for dams, guard gates, and other necessary works.

The canal line terminates in a basin, between the south and west branches, above Frankstown, at what may be called the foot of the Allegheny mountain, from which a turnpike road or rail way must be made, to connect with the navigation on the west side of the mountain. The Juniata was guaged at the confluence of the south and west branches, and was found to afford, in very low water, 521 cubic feet per minute. Bench marks have been frequently made along the line, and stakes placed to designate the track.

The work, on the west side of the mountain, can be executed considerably cheaper than on the east, owing to the difference in price of provisions and labor.

Mile 1st Begins at the Susquehanna river, on the east end of Duncan's island, and passes over good ground for a canal, along the north margin of the island—soil, sandy loam and gravel.

Excavation, 22,241 cubic yards, at 10 cents per yard	$2,224 10

Mile 2d. Continues along the margin of the island, some extra cutting will be necessary thro' a piece of timbered land. The line then crosses a branch or arm of the Susquehanna, which empties into the Juniata, another branch returns to the Susquehanna at the starting point of the canal, and forms a larger island above the one on which the canal line passes. The branch may be passed with an embankment, which is considered preferable to passing it with an aqueduct. Surface of water, 10.18 feet below; the line crosses the turnpike road, which will require a bridge.

Excavation, 27,166 cubic yards, at 10 cents,	2,716 60
Embankment, 10,632 cubic yards, at 13 cents,	1,382 16
Grubbing,	200
	$4,298 76

Mile 3d. Passes over good ground about half the distance, to the point of a ridge which puts down to the river, and must be cut through—some rock will be met with in the excavation—the line then passes along the foot of a hill in the bed of the river, and must be embanked and protected from the floods with a sloping stone wall or heavy pavement; one bridge will be required for a ferry road; some grubbing necessary.

Excavation, 13,916 cubic yards, at 10 cents,	1,391 60
Embankment, 44,523 cubic yards, at 16 cents,	7,123 68
Wall, 3,261 cubic yards, at 60 cents,	1,956 60
Rock, 620 cubic yards, at 62 cents,	384 40
Grubbing,	100
	$10,956 28

Mile 4th. Commences at the end of the bluff on last mile, and runs on a flat, 1 chain wide, tolerably good excavation for 32 chains, then runs along at the foot of a rocky hill for 9 chains, then another short piece of bottom land—a part of the mile is embankment in the bed of the river outside of the turnpike, so as to make the wall that supports the road. one side of the canal—the turnpike will require raising from 4 to 5 feet—there will be some difficulty in obtaining earth for embankment—it must be carted some distance—the bank must be protected with a slope wall.

Excavation, 21,461 cubic yards, at 10 cents,	2,146 10
Embankment, 23,510 cubic yards, at 20 cents,	4,702
Wall, 2,040 yards, at 62 cents,	1,264 80
	$8,112 90

Mile 5th. The first 28 chains is a continuation of the rocky bluff, the remainder passes over an uneven surface—difficult excavation—some deep cutting along the margin of the river—Lock No. 1, at the end of the mile—considerable grubbing—a few chains of the turnpike will require raising—the bank must be protected with a slope wall.

Excavation 22,360 cubic yards, at 12 cents,	2,683 20
Embankment 29,700 cubic yards, at 20 cents,	5,940
Wall 2,860 cubic yards, at 62 cents,	1,773 20
Grubbing,	150
	$10,546 40

Mile 6th Passes over gravelly soil, and stony—difficult to excavate—for the most part through woods, parallel with the turnpike—the line passes the head of the Juniata falls and Watson's ferry—a bridge must be built for the accommodation of the ferry—Lock No. 2, near the end of the mile.

Excavation 26,610 cubic yards, at 13 cents,	3,459 30
Embankment 4,854 cubic yards, at 13 cents,	631 02
Grubbing,	550
	$4,640 32

Mile 7th crosses Brightfield's run shortly after the commencement—this creek is 7.59 below 50 links wide, and must be passed with an aqueduct—after passing the run the ground is generally even and good excavation—some places large stone on the surface—some embankment will be required at Brightfield's run.

Excavation 20,430 cubic yards, at 11 cents,	2,247 30
Embankment 3,534 cubic yards, at 13 cents,	465 92
Aqueduct,	1,345
	$4,058 22

Mile 8th crosses a small creek that is 8.26 below, and must be passed under the canal—the line runs for a short distance on the margin of the river along the side of a gravelly ridge—good excavation—then crosses a point of wood-land—some large stone—after which the ground is good.

Excavation 22,725 cubic yards at 11 cents,	2,499 75
Embankment 1,200 cubic yards at 12 cents,	144
Aqueduct,	1,427
Grubbing,	178
	$4,248 75

Mile 9th passes over a flat one chain and a half wide, and runs by the side of the turnpike—the whole distance along the foot of a steep hill—some extra cutting cannot be avoided—soil sandy loam, clay and round stone.

Excavation 22,086 cubic yards, at 12 cents,	$2,650 32

Mile 10th passes over hard, stony ground for 32 chains to lock No. 3, then runs on sideling ground, good excavation, and crosses the turnpike, which will require a new road above the canal, about 32 chains—one small brook will require a culvert, and a bridge for Powers' ferry road.

Excavation 24,085 cubic yards, at 11 cents,	2,649 35
32 chains of turnpike road, at 37 dollars,	1,184
Culvert,	300
	$4,133 35

Mile 11*th* passes over clay, loam and gravelly soil on the level required—some grubbing will be necessary, and a culvert to pass a small brook, also a road bridge.

Excavation 22,600 cubic yards, at 12 cents,	2,712
Grubbing,	150
Culvert,	350
	$3,212

Mile 12*th* will require considerable extra excavation which cannot be avoided; near the end of the mile is a projecting point of rock which must be cut off and an embankment of 12 chains in the bed of the river, 9 feet below and will require walling—one farm bridge.

Excavation 26,960 cubic yards, at		12 cents,	3,235 20
Embankment 14,320	do.	15	2,148
Rock 400	do.	60	240
Wall 1,545	do.	62	957 90
			$6,581 10

Mile 13*th*. The first part of this mile runs on a narrow flat with extra cutting—the line then passes along the foot of a very precipitous and rocky hill in the river, and will require embankment and wall to the surface of water 6 feet below. The surplus earth in the excavation will serve in part for the embankment, the residue can be taken from the opposite side of the river.

Excavation 19,174 cubic yards, at		10 cents,	1,917 40
Embankment 37,050	do.	20	7,410
Wall 4,508	do.	62	2,794 96
			$12,122 36

Mile 14*th* continues 16 chains under the hill last mentioned—lock No. 4, at the beginning of a small flat covered with timber, which continues 8 chains, then another bluff of 12 chains requiring embankment, after which a short piece of stony excavation and another bluff which continues to the end of the mile—bed of the river 11.58 below.

Excavation 9,082 cubic yards, at		12 cents,	1,089 84
Embankment 70,637	do.	18	12,714 66
Wall 5,480	do.	62	3,397 60
			$17,202 10

Mile 15th passes over rough stony ground, to Wildcat creek, which must be passed with an aqueduct 150 feet in length—surface of the creek 11 feet below—after passing the creek the ground is good—some grubbing.

Excavation 27,640 cubic yards, at 12 cents,	$3,316 80
Grubbing,	200
Aqueduct,	2,550
	$6.066 80

Mile 16th. The first part of this mile will require embankment in the river to pass a rocky ledge 7.70 below—the ground is then gravelly, with round stone, and deep cutting along the bank of the river—the line crosses a ferry road and a small creek that will require a culvert—the extra cutting will furnish stuff for the embankment.

Excavation 26,968 cubic yards, at 13 cents,			3,414 84
Embankment 25,400	do.	16	4,064 00
Wall 2,451	do.	62	1,519 62
Culvert,			681
Grubbing,			100
			$9.779 46

Mile 17th passes over sideling ground and crosses the Cocalamus creek, one chain wide and 7 feet below—some extra cutting on the east bank—lock No. 5, on the west bank of creek—the ground is then good for the remainder of the mile—some extra cutting—one bridge will be necessary for the ferry road.

Excavation 31,390 cubic yards, at 12½ cents,	3,923 75
Aqueduct for Cocalamus creek,	1,850
	$5,773 75

Mile 18th passes over very good ground for a canal—soil, sand, gravel and some cobblestone—passes the village of Millerstown—some grubbing on the west end of the mile—a culvert will be required for a very copious spring—two bridges for the streets.

Excavation 26,600 cubic yards, at 11 cents,	2,926
Culvert,	240
Grubbing,	50
	Dolls. 3,216

Mile 19th passes through the gap of Tuscarora mountain—the first part is gravelly soil in woods—some excavation of rock will be necessary near the middle of the mile—the remainder is gravelly on the margin of the river, and extra cutting.

Excavation 31,309 cubic yards, at 13 cents,			4,070 17
Rock 796	do.	75	597
Grubbing,			150
			Dolls. 4,817 17

Mile 20th, crosses a small creek that must be passed under the canal, the line runs over gravel and clay soil, and crosses a private lane. Lock No 6.

Excavation, 22,780 cubic yards, at 12,	2,733 60
Culvert,	960
	$3,693 60

Mile 21st. The first 18 chains is easy to excavate, the next 22 chains will require considerable embankment along the side of a steep ridge of rock and loose stone, and for a short distance the turnpike must be raised, the ground is then good the remainder of the mile. One bridge will be required.

Excavation, 16,430 cubic yards, at 12	1,968 36
Embankment, 16,728 do. at 13	2,174 64
	$4,143 00

Mile 22d, runs on a flat of good excavation, along the foot of a steep ridge, for about half the distance, then a steep gravelly ridge runs down to the river, requiring half the width of the canal to be cut into it, about 24 chains, to form the bank, the outside of which will reach the water; the remainder of the mile good ground for a canal.

Excavation, 29,300 cubic yards, at 11,	$3,223

Mile 23d, Passes over very stony ground, on flat or bottom land, crosses Delaware creek, which is 10 feet below; and bed 30 links wide. The valley is two chains wide; will require embankment. After crossing the creek, the ground has a gentle ascent north, full of small round stone—crosses the Thompsonstown road.

Excavation, 24,110 cubic yards, at 13.	3,134 30
Embankment, 2,640 do. at 13,	343 20
Aqueduct,	1,982
	$5,459 50

Mile 24th, is good for a canal, except four chains, that is too low at a little run, where a culvert will be required—two farm bridges on this mile.

Excavation, 22,860 cubic yards, at 11,	2,514 60
Embankment, 3,100 do. at 12,	372
Culvert,	420
	$3,306 60

Mile 25th. The first 16 chains passes through woods, over bottom land, good excavation—the next 40 chains runs in a wet swampy piece of ground. About the required level at the foot of a steep ridge, the water can be easily drained; the ground then rises suddenly to nine feet above, and continues extra cutting the remainder of the mile.

Excavation, 36,000 cubic yards, at 13,	4,680
Grubbing and clearing,	540
	$5,220

Mile 26th, passes over sideling ground on the margin of the river, and incurs deep cutting, that cannot be avoided; the soil is gravelly loam, good to excavate.

Excavation, 43,400 cubic yards, at 10½,	$4,557

Mile 27th. About 63 chains of this mile, is good excavation, the remainder requires embankment along the foot of a limestone ledge, partly in the bed of the river. A culvert will be necessary to pass a brook; also two bridges: a wall will be necessary to protect the embankment part of the ledge, river 11 feet below.

Excavation, 13,100 cubic yards,		at 10,	1,310
Embankment, 18,812	do.	at 16,	3,009 92
Culvert			376
Wall, 1,530	do.	at 60,	918
			$5,613 92

Mile 28th, passes over gravelly loam, on bottom land—two bridges.

Excavation, 20,970 cubic yards, at 10,	$2,097

Mile 29th. Some part of this mile will require extra cutting. On the bank of the river, mostly sandy loam and gravel; near the west end a considerable embankment must be made, under a high bank of limestone, alternating with slate—a low stoney beach along the river, covered only in high water, forms a good foundation for the bank—a wall will be necessary; stone can easily be obtained.

Excavation, 27,840 cubic yards,		at 10½,	2,923 20
Embankment, 19,890	do	at 16,	3,182 40
Wall, 2,568	do	at 50,	1,284
			$7,389 60

Mile 30th, crosses Doe run, at New Mexico, 10.80 below, 20 links wide—one large arch would discharge the water in time of floods; also crosses a dry ravine, that will require a culvert to pass the water in time of heavy rains. The excavation is generally good. Lock No. 8, located on this mile. Two road bridges will be required.

Excavation, 26 700 cubic yards,		at 11,	2,937
Embankment, 2,160	do.	at 14,	302 40
Two culverts,			1,580
			$4,819 40

Mile 31st, passes generally over sideling ground, near the bank of the river, gravelly soil, and easy to excavate.

Excavation 22.400 cubic yards, at 11,	$2,464

Mile 32*d*, passes for the first part along the margin of the river—some deep cutting is necessary—soil gravelly loam, and embankment is necessary to pass a projecting point of rock, a a part of which must be cut off. The rock is composed of slate, lime, and sand stone; the remainder is good excavation—a culvert will be required.

Excavation, 30,000 cubic yards, at	12,		3,600
Embankment, 13,800,	do	16,	2,208
Wall, 900	do	50,	450
Rock, 460	do	60,	276
Culvert,			350
			$6,884

Mile 33*d*, will require some embankment to cross a ravine, and a culvert for the brook. A new channel must be made for the brook; the line crosses it twice in four chains. A part of this mile runs along the side of a steep gravelly bank, on the margin of the river; the outside bank of the canal will run near the water's edge, and will require some protection from the floods—some grubbing. Lock No. 9, on the west end of this mile.

Excavation, 38,152 cubic yards, at	12,		4,578 24
Embankment, 8,620	do	14,	1,206 80
Wall, 841	do	62,	521 42
Grubbing,			150
Culvert,			560
			$7,016 46

Mile 34*th*. The first 32 chains will be hard stoney excavation, on sideling ground; then a short piece of embankment along the river—the line then passes over a narrow flat, and crosses a creek 10.50 below. Soon after passing the creek, an embankment becomes necessary to pass a bluff of slate rock—surface of river, 11.22 below. An island opposite will afford good material for embankment—the line passes the village of Mifflin: one bridge for the ford.

Excavation, 15,840 cubic yards, at	14,		2,218 72
Embankment, 32,636	do	20,	6,527 20
Wall, 3,220	do	70,	2,254
Large culvert,			1,450
			$12,449 92

Mile 35*th*. The first 8 chains is a continuation of the last mentioned embankment—the next 56 chains runs over bottom land, easy to excavate; crosses a small brook, that must be passed under the canal. Lock No. 10, on bank of river—the remainder is on the side of a stoney ridge, and will be difficult to excavate.

Excavation, 23,904 cubic yards, at	20,	4,780	80
Embankment, 10,632 do	15,	1,594	80
Wall, 962 do	70,	673	40
Culvert,		436	
		$7,485	

Mile 36*th* passes, for the first part, along the side of a gravelly ridge, to the bank of Lost creek, 18 50 below, which must be passed with one aqueduct, 200 feet in length. The ground, after crossing the creek, is a little too low for about 8 chains, after which the line passes on sideling ground, consisting of gravel and stone, and ends in the valley of a small creek.

Excavation, 24,624 cubic yards, at	13,	3,201	12
Embankment, 6,880 do	16,	1,100	80
Aqueduct,		3,845	
		$8,146	92

Mile 37*th*, commences in the valley of a small creek, that will require a culvert; then runs 24 chains across a flat of good excavation. The next ten chains is along the side of a steep gravelly ridge, mostly in the river. Lock No. 11, at the west end of the embankment—from the lock, tolerable good excavation to the end of the mile.

Excavation, 22,576 cubic yards, at	12½,	2,822	
Embankment, 9,582 do	16,	1,533	12
Wall, 840 do	75,	630	
Grubbing,		100	
Culvert,		415	
		$5,500	12

Mile 38*th*, passes over undulating ground, consisting of gravelly loam and stone. Near the middle of the mile the turnpike touches the canal, and will require raising—two small brooks will fall into the canal on this mile,

Excavation, 24,552 cubic yards, at	14,	3,437	28
Embankment, 3,440 do	15,	516	
Grubbing,		58	
		$4,011	28

Mile 39*th* Runs about parallel to the turnpike, or between the turnpike and river, over an uneven surface, difficult excavation, entrance to Long Narrows,—ground covered with small timber.

Excavation 26,560 cubic yards, at 15 cents,	3,984	
Grubbing,	250	
	$4,234	

Mile 40*th* Passes over sideling ground for half the distance, many places large masses of detached rock on the surface, the remainder runs along between the turnpike and the river, will en-

counter some deep cutting, considerable grubbing, some of it large timber.

Excavation 30,568 cubic yards, at 13 cents,	3,973 84
Grubbing,	370
	$4,343 84

Mile 41st. The first 16 chains passes along the margin of the river, over gravelly soil and round stone to lock No. 12, the remainder of the mile passes along the lower side of the turnpike, some places the bank can be made on a narrow flat, in others in the bed of the river; the turnpike is too low in some places, and must be raised; the hill along which the canal runs is very precipitous, but will generally afford rough material to form the outside of the bank, but good water tight earth will be difficult to obtain; a protecting wall will be necessary along part of this mile. Stone are convenient.

Excavation 13,080 cubic yards, at 13 cents,				1,700 40
Embankment 42,552	do	15	do	6,382 80
Lining 21,240	do	20	do	4,248
Grubbing,				350
Wall 4,820 yards, at 50 cents,				2,410
				$15,091 20

Mile 42d Continues to pass along between the river and the turnpike in the narrows, average of embankment 9 feet below. Stone in sufficient quantities for the wall can be had along the line; earth and stone that have he appearance of having fallen from the hill can be taken from above the turnpike, for the outside of the bank; no excavation of consequence.

Embankment 61,646 cubic yards, at 15 cents,				9,246 90
Lining 33,640	do	25	do	8,410
Wall 7,231	do	50	do	3,615 50
Grubbing,				350
				$21,622 40

Mile 43d. The first 12 chains continue along the side of the turnpike, it then diverges and runs over very good ground for 36 chains, good excavation, then commences embankment and continues to the end at the toll gate.

Excavation 11,952 cubic yards, at 12½ cents,				1,494
Embankment 40,564	do	18	do	7,301 52
Wall 3640	do	50	do	1,820
Grubbing,				450
				$11,065 52

Mile 44th. Runs on flat or bottom land 16 chains, and extra cutting to lock No. 13, the extra earth must be carried back to the embankment on the last mile, the remainder of the mile is gravelly, loam and sand, some grubbing.

Excavation 31,762 cubic yards, at 12 cents,	3,811 44
Grubbing,	125
	$3,936 44

Mile 45th Is generally good for about half the distance, then a point of sandstone puts down which must be excavated for 5 chains, after which the ground is very good. Jack's creek crosses the line on this mile 13.78 below, and will require an aqueduct 100 feet in length; some embankment will be necessary about the creek; also a farm bridge.

Excavation 22,696 cubic yards, at		12	cents,	2,725 52
Embankment 2,463	do	14	do	344 82
Rock 1,466	do	75	do	1,099 50
Aqueduct,				2,120
				$6,287 84

Mile 46th Passes over clayey soil along the foot of a ridge to lock No. 14,—the ground ascends gradually to the level of the second bottom or flat,—the line follows along the margin of the ridge over clay loam and gravelly soil, good excavation to within a few chains of the Kishocoquillis creek, where an embankment becomes necessary, and an aqueduct to pass the creek, which is 17.83 below: this stream would be valuable as a feeder, and can be taken into the canal by a cut of three-fourths of a mile. One bridge.

Excavation 24,286 cubic yards, at		12	cents,	2,908 32
Embankment 4,725	do	16	do	756
Aqueduct,				2,450
				$6,114 32

Mile 47th Commences at Lewistown and passes for 21 chains along the foot of a steep ridge, on a flat 2 chains wide, gravelly soil, then runs along the side of a steep ridge on the margin of the river for 20 chains, some slate rock will be met with on the bottom of the excavation; the remainder of the mile is on a flat along the foot of a gravel ridge, good excavation, the line crosses two small runs that must be let under the canal; one bridge for the street at Lewistown, and a farm bridge.

Excavation 28,560 cubic yards, at 13 cents,	3,712 80
2 culverts,	860
	$4,552 80

Mile 48th Passes on a narrow flat at the foot of a gentle ascent of gravelly loam for 60 chains; the line crosses two brooks, one will fall into the canal; the other will require a culvert,—the remainder of the mile will be embankment in the bed of the river, 16 feet below, under a high bluff of slate and grawake rocks; the earth for embankment can be procured from either end of the bluff.

Excavation 19,920 cubic yards, at		12	cents,	2,390 40
Embankment 46,243	do	19	do	8,786 12
Wall 2,882	do	62	do	1,755 84
Culvert,				450
				$13,382 36

Mile 49th. The first 6 chains is embankment, the next 20 chains run on a narrow flat in woods along the foot of a steep hill, tolerably good excavation, then a short piece of embankment partly in the river, after which the ground is good.

Excavation 19,662 cubic yards, at		12	cents,	2,359 44
Embankment 26,208	do	18	do	4,717 44
Wall 1,520	do	70	do	1,134
Grubbing,				175
				$8,385 88

Mile 50th. Passes over sandy loam, and for a short distance at the beginning there will be some extra cutting that cannot be avoided, one bridge will be necessary.

Excavation 26,360 cubic yards, at		11	cents,	$2,921 60

Mile 51st. Passes along the margin of the river over sandy loam, extra excavation cannot be avoided, an embankment will be necessary towards the west end of this mile to pass a high bluff of slate rock from 6 to 10 feet below.

Excavation 30,526 cubic yards, at		11½	cents,	3,510 49
Embankment 31,896	do	18	do	5,741 28
Wall 2,441	do	65	do	1,586 65
				$10,838 42

Mile 52d. Commences on a narrow flat of good excavation, a few chains to lock No. 15, near the lock the river takes a short turn to the left, the line cuts across the bend 32 chains from 1 to 6 feet too high, the extra earth can be disposed of in an embankment that becomes necessary to pass a very precipitous and rocky hill of decomposed limestone and slate, embankment 15 feet below, the remainder of the mile is good excavation; one farm bridge.

Excavation 28,340 cubic yards, at		12	cents,	3,400 80
Embankment 54,762	do	18	do	9,853 56
Wall 3,472	do	70	do	2,430 40
				$15,684 76

Mile 53d Passes generally over bottom land easy to excavate, five ravines and brooks cross the line on this mile, two of which will require culverts, one farm bridge.

Excavation 22,635 cubic yards, at		11	cents,	2,492 05
Embankment 1,635	do	15	do	245 25
2 culverts,				928
				$3,665 30

Mile 54th Passes for the most part along the margin of the river at the foot of a gentle declevity, soil sandy loam and gravel, a public road crosses the line, a culvert will be required for a brook.

Excavation 26,242 cubic yards, at 12 cents,	3,149 04
Culvert,	984
	$4,133 04

Mile 55th. The first 8 chains run along at the foot of a steep gravelly ridge, the next 24 chains run on a stony beach at the foot of a sand stone ledge from 4 to 10 feet below, the outside of the bank will require walling. Brightfield's run enters within this point 10.67 below, and will require an aqueduct, lock No. 16 at the end of the bluff, after which the ground is good, the line crosses two small runs which must be passed under,—one farm bridge.

Excavation 16,264 cubic yards, at 12 cents,				1,951 68
Embankment 25,440	do	18	do	4,579 20
Wall 2,184	do	60	do	1,310 40
2 culverts,				1,275
				$9,116 28

Mile 56th Is generally good excavation, 20 chains which pass a limestone ledge will require embankment in the bed of the river, 17.30 below, and protected with a wall, one farm bridge.

Excavation 20,252 cubic yards, at 12 cents,				2,430 24
Embankment 27,056	do	18	do	4,870 08
Wall 2,660	do	62	do	1,649 20
				$8,949 52

Mile 57th begins in the woods, on a low flat, crosses a ravine 2 chains wide, and will require a culvert; good excavation until the point of a ridge puts into the view, and will require half the width of the canal to be cut into the ridge to get stuff sufficient for the bank, a short piece of which must be protected by a wall; the remainder of the mile is good excavation. One farm bridge.

Excavation,	23,904 cubic yds. at 12 cents,		2,868 48
Embankment,	7,780 do. do. at 18		1,011 40
Wall,	1,242 do. do. at 62		770 04
Grubbing,			450 00
Culvert,			975 00
			$6,074 92

Mile 58th passes generally over sideling ground—soil sandy loam and gravel, with small round stone: some timber on the west end.

Excavation of 22,640 cubic yards, at 12½	2,830
Grubbing,	70
	$2,900

Mile 59th Passes along the foot of a low ridge, over clay and gravel, generally easy to excavate. Wakefield's creek and another small run cross the line: the bed of the creek is ten feet below, and 50 links wide: a public road crosses the line near the beginning of the mile.

Excavation, 26,267 cubic yards at 12½	3,283 37½
Aqueduct and culvert,	1,838 00
	5,121 37½

Mile 60th Begins with a rocky bluff, requiring an embankment in the bed of the river, 14 chains, 9.71 below. Lock No. 17, at the west end of the embankment—the line then passes along the foot of the highland—good excavation. One farm bridge will be necessary.

Excavation,	18,606 cubic yards, at 12,		2,232 72
Embankment,	18,678 do.	18,	3,362 04
Wall,	1,680, do.	62,	1,041 60
			$6,636 36

Mile 61st. The first part runs on the side of a steep gravelly ridge, near the bank of the river, considerably undulating. The last 32 chains are over a gentle slope—rather difficult excavation. Fourteen chains are through timbered land.

Excavation of 22,463 cubic yards, at 13 cents,	2,920 19
Grubbing,	100
	3,020 19

Mile 62d. The first 48 chains of this mile pass over sideling ground. Some large stone on the surface, and some limestone rock may be met with in the bottom of the excavation. A small creek crosses the line 11.38 below—50 links wide. After crossing the creek, there are 8 chains of good excvation, then an embankment continues past the town of Waynesburg, to the end of the mile. The bed of the river is 13 feet below.

Excavation,	15,848 cubic yards, at 12½,		1,981
Embankment,	42,072 do.	18,	7,572 96
Wall,	2,928 do.	70,	2,049 60
Culvert,			1,565
			$13,168 56

Mile 63d will require some extra cutting, after crossing M'Vey's run, and some embankment—ravine 12.26 below. A large arch will discharge the water. The line continues along the bank of the river, and crosses another run requiring a culvert. Lock No. 18—a rocky bluff commences, and occupies the last four chains of this mile, requiring a heavy embankment. A bridge for a road at the beginning of this mile.

Excavation,	31,537 cubic yards, at	12,	3,784	44
Embankment,	9,248 do.	16,	1,479	68
Wall,	568 do.	60,	340	80
Two culverts,			1,843	
			7,447	92

Mile 64th commences with a continuation of the heavy embankment, which extends 16 chains along the points of slate rock, then a low piece of bottom land begins, across which the line runs for 24 chains, along the foot of a steep ridge, the side of which will afford earth for the embankment; the residue of the mile is not very good excavation. A brook crosses the line, 11 feet below, which must be passed under the canal. One farm bridge will be required.

Excavation,	16,980 cubic yards, at	12 cents,	2,037	60
Embankment,	32,848 do.	16,	5,255	68
Wall,	2,234 do.	60,	1,340	40
Culvert,			620	
			9,253	68

Mile 65th passes over good ground for a canal—sandy loam—easy to excavate—will require one farm bridge.

Excavation, 22,646 cubic yards, at 11 cents,	2,491	06

Mile 66th. A part of this mile is very stony and difficult to excavate; 24 chains is through heavy timbered land; one brook will fall into the canal; one bridge will be necessary.

Excavation, 26,326 cubic ys. at 13 c.	3,422	38
Grubbing,	240	
	$3,662	38

Mile 67th passes along the margin of the river, 24 chains, to lock No. 19, near a riffle called Samuel's fish dam, the residue runs over sideling ground, sandy loam, easy to excavate.

Excavation, 25,680 cubic ys. at 11 c.	$2,824	80

Mile 68th will require 8 chains of heavy embankment; to pass a high rocky hill, it will be necessary to excavate about three chains of limestone before coming to the embankment; after passing the bluff, the point of a ridge, 4 feet too high, must be cut through; then good excavation to the end of the mile; the line crosses a brook that is 10 feet below, which will require a culvert.

Excavation, 19,527 cubic yards, at 12 c.	2,343	24
Embankment, 14,024 cubic yards at 16,	2,243	84
Rock, 849 c. y. at 60,	509	40
Wall, 1,136 c. y. at 50,	568	
Culvert,	538	
	$6,202	48

Mile 69th passes, for the most part, along the margin of the river, in a road at the foot of a high rocky hill; the road in places must be moved; some extra cutting cannot be avoided, and some grubbing necessary.

Excavation, 27,843 cubic yards, at 12½ c.	3,480 37
Grubbing,	160
24 chains of road,	380
Dolls.	4,020 37

Mile 70th. This mile continues in the road 64 chains. to the bank of Beaver dam run, which is 8 feet below, and will require a large culvert; some embankment will be necessary after crossing the run. Lock, No. 20, near the west end of the mile.

Excavation, 23,512 cubic yards, at 12½ c.	2,939
Embankment, 6,680 do. at 13,	868 40
Culvert,	1,375
64 chains of road, at 20 dolls.	1,280
Dolls.	6,462 40

Mile 71st. The excavation will not afford sufficient earth to form the banks for the first 24 chains; the remainder passes over excellent ground for a canal, to the end of the mile; two bridges will be required.

Excavation, 19,521 cubic yards, at 12,	2,342 52
Embankment, 5,832 do. at 15,	874 80
Dolls.	3,217 32

Mile 72d begins with lock No. 21, and passes over good land for a canal—soil, gravelly loam and small stone; some embankment will be necessary at a small ravine and brook; 16 chains passes through woods; one bridge will be required. This mile passes Aughwick falls.

Excavation, 25,116 cubic yards, at 12½ c.	3,139 50
Embankment, 1,442 do. at 13,	187 46
Grubbing,	160
Dolls.	3,486 96

Mile 73d passes over gravel and cobble stone, for half the mile, to lock No. 22—difficult to excavate. The line crosses the outlet of a large spring at Newton Hamilton, that will require a culvert; the remainder is good excavation, and crosses another brook that will require a culvert. One bridge will be necessary.

Excavation, 25,920 cubic yards, at 13 c.	3,369 60
2 culverts,	950
Dolls.	4,319 60

Mile 74th passes over an undulating surface, generally along the margin of the river—soil, gravelly loam; embankment will be necessary to pass a small ravine. The canal will destroy a tan-yard. Some grubbing—the latter part runs at the foot of a rocky hill; 18 chains of road must be moved.

Excavation, 27,383 cubic yards, at 12½ c.		3,410 37
Embankment, 1,642 do. at 13,		213 46
Grubbing,		150
Removing road,		240
	Dolls.	4,013 83

Mile 75*th* passes generally over sideling ground—soil gravelly loam; good excavation—lock No. 23, near the west end of this mile.

Excavation, 19,060 cubic yards, at 12 c.	Dolls.	2,284 80

Mile 76*th* passes over ground very favorable for a canal—soil, gravelly loam; 14 chains of timbered land.

Excavation, 19,685 cubic yards, at 12 c.		2,362 20
Extra grubbing,		140
	Dolls.	2,402 20

Mile 77*th* is good ground for a canal, about sixty chains; then a steep, stony side hill, having a narrow flat at the base, which is six feet too low, and on which the bank must be made—16 chains of timbered land. Lock No. 24, about the middle of the mile.

Excavation, 21,248 cubic yards, at 12 c.		2,549 76
Embankment, 11,366 do. at 16,		1,818 56
Grubbing,		160 00
	Dolls.	4,528 32

Mile 78*th* is favorable ground for a canal. One culvert will be required; two public roads cross the line—some grubbing will be necessary.

Excavation, 26,463 cubic yards, at 12 c.		3,175 56
Embankment, 1,440 do. at 14,		201 60
Culvert,		370 00
Grubbing,		200 00
	Dolls.	3,947 16

Mile 79*th*. Lock No. 25 is located near the beginning of this mile. The line passes over an uneven surface—soil, sandy loam, gravel and clay; generally good excavation. Two small brooks will fall into the canal—20 chains through woods.

Excavation, 27,371 cubic yards, at 12½ c.		3,421 37
Grubbing,		200 00
	Dolls.	3,621 37

Mile 80*th* crosses three points of ridges, from 1 to 4 feet too high; is considerably undulating, and difficult excavation, about 54 chains; then an embankment becomes necessary in the river, 11 feet below, along a high, perpendicular limestone ledge to the end of the mile. Some grubbing, and one bridge —the embankment must be walled.

Excavation,	18,592 cubic yards,	at 12½ c.		2,324
Embankment,	35,376 do.	at 19,		6,724 44
Wall,	2,960 do.	at 60,		1,776
Grubbing,				150
			Dolls.	10,974 44

Mile 81*st* is a continuation of the embankment along the bluff, about 28 chains; the line then passes over a narrow flat, 10 feet above, about thirteen chains, to lock No. 26. The extra earth will afford material, in part, for the embankment. Ten chains from the lock, commences another embankment in the river, which continues to the end of the mile, along a ledge of slate rock—river 12.50 below. The wall must be continued to the end of the embankment.

Excavation,	16,473 cubic yards,	at 12 cents,		1,976 76
Embankment,	76,648 do.	18,		13,796 64
Wall,	6,292 do.	62,		3,901 04
				$ 19,674 44

Mile 82*d* will require 4 chains of embankment, at the beginning; then twelve chains of excavation, in which some rock will be met with. The next twenty-six chains passes under high cliffs of rock, sometimes occupying the road. Jack's Narrows—considerable embankment will be necessary. There will be some difficulty in obtaining material for embankment. A wall will be required. The remainder of the mile rough and uneven, but will afford excavation sufficient to form the bank—a bridge will be required for Drake's ferry road.

Excavation of 16,936 cubic yards, at 13,				2,201 68
Embankment, 40,450	do	22,		8,899
Wall, 2,621	do	50,		1,310 50
26 chains road,		$25,		650
Rock, 928 cubic yards, at 75,				736 50
				$13,797 68

Mile 83d commences with deep cutting along the margin of the river, on a flat one cham wide, generally good excavation for 48 chains; then runs along under a rocky hill. An embankment must be made in the river, 24 chains outside of the road. The turnpike passes along this mile, and in some places will require raising; surface of river 6 feet below. The last 8 chains good excavation.

Excavation, 20,438 cubic yards, at 12,			2,452 56
Embankment, 24,504 road & canal, 20,			4,900 80
Wall, 2,160,		60,	1,296
			$8,649 36

Mile 84th begins with lock No. 27, passes over sideling ground, and, for a short distance, along the edge of a water course, forming an island in moderately high water; the last fourteen chains will be embankment in the bed of the river,

3.27 below; under a high bluff of rocks, the road will require raising.

Excavation, 21,912 cubic yards, at 12c.			2,629 44
Embankment, 18,794	do. canal and road, at 18,		3,415 32
Wall, 1,686	do. at 62,		1045 32
		Dolls.	7,090 08

Mile 85th continues with embankment under the last mentioned bluff, 20 chains along which the road must be raised, 4 chains from the bluff to lock No. 28—from the lock to the end of the mile the line passes along a gentle declivity—soil gravelly loam—good excavation—one bridge will be necessary.

Excavation 19,921 cubic yards, at 12 cents,			2,390 52
Embankment 24,123	do.	18	4,342 14
Wall 2,376	do.	62	1,473 12
			$8,205 78

Mile 86th. The first 16 chains passes over gravelly loam, 10 chains of which is through woods, then an embankment becomes necessary about 48 chains under a steep bank—loose rock and slate 9 feet below—the next 15 chains will be deep cutting along the foot of a steep ascent, to lock No. 29—the line then crosses the point of a ridge.

Excavation 16,757 cubic yards, at 12 cents,			2,010 84
Embankment 51,170	do.	18	9,210 60
Wall 5,208	do.	60	3,121 80
Grubbing,			100
			$14,443 24

Mile 87th passes over sideling ground, consisting of gravelly loam, round stone and large rock, along the branch of the river forming an island—the line crosses a small brook requiring a culvert, and crosses mill creek near the west end of the mile, 11.28 below, an aqueduct 60 feet in length will be required; an embankment 4 chains long; 9 feet below, to cross half the valley; the the stream branches above the point of crossing, and forms an island; the water of both branches can be turned into one; this mile ends in the valley of the creek; lock No. 30 is located on this mile.

Excavation 23,894 cubic yards at 14 cents,			3,345 16
Embankment 9,520	do.	16	1,523 20
Aqueduct and culvert,			1,765
			$6,633 36

Mile 88th begins in the valley of Mill creek—crosses the second branch—the line then crosses the point of a ridge to another small creek, 11 feet below, requiring an embankment, to cross the ravine, 10 chains long on the top and 6 chains on the bottom, 8 feet below; then rises to extra cutting about 15 chains, and descends to another brook and ravine, requiring 4 chains of embank-

ment, after which the line runs along the bank of the river in cutting easy to excavate; one bridge will be necessary on this mile.

Excavation 25.642 cubic yards at		11 cents,	2,820 62
Embankment 21.695	do.	14	3,037 30
Two large culverts,			1,645
			$7,502 92

Mile 89*th* passes along the side of a gravelly ridge for half the distance; the remainder passes over bottom land of clay and sandy loam, one small brook will fall into the canal; a few chains lie through swampy ground, having a ridge between the canal and the river.

Excavation 26,880 cubic yards, at 12½ cents, $3,360

Mile 90*th* is uneven and cuts the points of two ridges, making some extra cutting—soil, clay and gravelly loam—one farm bridge will be required.

Excavation 27,636 cubic yards, at 12½ cents, $3,454 50

Mile 91*st* passes over flat or bottom land, parallel with and near the turnpike road—soil, clay and gravel, with some stone—good excavation—lock No. 31, about the middle of this mile, crosses a brook 7.24 below, 25 links wide and will require a large culvert—some embankment will be necessary—extra cutting after crossing the brook, to the end of the mile—some grubbing.

Excavation 25,242 cubic yards, at		12½ cents,	3,155 25
Embankment 3,461	do	14	484 54
Grubbing,			125
			$3,764 79

Mile 92d passes on a narrow flat in the turnpike road, at the foot of a high hill of grawacke rock; about 40 chains to lock No. 32, then an embankment becomes necessary in the bed of the river 16 chains; the turnpike must be raised; the line then passes along a steep side hill and crosses the turnpike on the bank of Standingstone creek; the water in this creek is 11 feet below, and will require an aqueduct 130 feet in length; 3 chains of embankment will be necessary after passing the creek, 4½ feet below, to the end of the mile; a culvert for a small run will be required.

Excavation 16,980 cubic yards at		12 cents,	2,037 60
Embankment 35,060	do.	18	6,310 80
Wall 1,952			1,171 20
Aqueduct 2,360 dollars; culvert 450 dollars			2,810
			$12,329 60

Mile 93*d* Begins with an embankment across the valley of Standingstone creek 13 chains in length, from 2.50 to 4.50 below. Lock No. 33 and 34, with a short pond between, are located at the commencement of the high land in the town of Huntingdon. After locking the ground rises suddenly to 11 feet above the level, passes through a street, leaving sufficient room on the north side

of the canal for a road, and taking part of the width of the canal from the south tier of lots, which will occasion the removing of the out buildings, stables, &c. the ground soon descends to a proper level after passing the town and crossing a ravine 17.50 below, 6 chains wide on the top and 2 on the bottom. The line continues on the side of a steep ridge to the end of the mile. Three bridges will be required and a culvert for the last ravine; the extra excavation will furnish stuff to form the embankment.

Excavation 31,760 cubic yards, at			12½ cents,	3,970	
Embankment 29,276	do		17 do	4,976	92
Culvert,				886	
				$9,832	92

Mile 94th Passes along the side of a steep ridge consisting of gravelly loam and cobble stone for the first 5 chains; the remainder is over a very rough and uneven surface near the bank of the river along the foot of a rocky hill. The last 16 chains will occupy the road; a new one must be made above the canal. 10 chains is through woods.

Excavation 27,526 cubic yards, at 13 cents,				3,578	38
16 chains of road,				320	
Grubbing,				100	
				$3,998	38

Mile 95th. The first 48 chains is very rough and undulating, passing for the most part over loose rock at the foot of a high rocky hill; excavation is difficult; some solid rock must be excavated, some embankment will be required, the remainder is on a flat 1 chain wide, tolerably easy to excavate, soil sandy loam and gravel, lock No. 35 near the end of the mile; a new road must be made the whole length of the mile.

Excavation 23,040 cubic yards, at			13½ cents,	3,110	40
Embankment 4,885	do		16 do	781	60
Rock 960	do	$1 00		960	
Road,				950	
Grubbing,				235	
				$6,037	

Mile 96th Passes over ground similar to the last mile—considerable rock cutting and embankment will be necessary and a new road; some grubbing.

Excavation 21,760 cubic yards, at			13½ cents,	2,937	60
Embankment 12,341	do		16 do	1,974	56
Rock 1,623	do	$1 00		1,623	
Road,				1,375	
Grubbing,				300	
				$8,210	16

Mile 97th. The first 28 chains is a continuation of the ground as described, to lock No. 36; the line then runs on a gentle slope of good excavation, crosses the outlet of a large spring that will fall into the canal. 12 chains lie through timbered land.

Excavation 29,347 cubic yards, at 12½ cents,		3,668 37
Rock 640	$1 00	640
Road,		458
Grubbing,		225
		$4,991 37

Mile 98th Passes over gravelly loam interspersed with round stone, generally good excavation, considerable light grubbing; two locks are located on this mile, Nos. 37 and 38, a culvert will be required to discharge the water from a large spring, near the end of the mile. A farm bridge will be required.

Excavation 26,369 cubic yards, at 12½ cents,	3,164 28
Culvert,	887
Grubbing,	300
	$4,351 28

Mile 99th Is very good for a canal the first 56 chains, the next 16 chains pass along the foot of a high perpendicular rock, and will require embankment and wall in the bed of the river, 7.50 below outside of the road which must be raised, the river at this point must be widened and the earth taken for embankment, the remaining 8 chains passes Shœneberger's forge; good excavation; a bridge will be required, and a small culvert for a spring.

Excavation 21,248 cubic yards, at 12 cents,	2,549 76
Embankment 21,760 do canal and road 20 cents,	4,352
Culvert,	275
	$7,176 76

Mile 100*th*, passes through a garden in rear of Shoeneberger's house. Lock No. 39, located near the garden. Considerable embankment will be necessary to pass the valley of Shaver's creek, 6.32 below, and will require an aqueduct 130 feet in length. After passing the creek, some extra excavation will be incurred, which can be used in the embankment, Lock No. 40 is located at the end of the extra cutting. The excavation is good to near the end of the mile, and to the valley of the little Juniata; two bridges will be necessary.

Excavation, 32,256 cubic yards, at 12½,	4,032
Embankment, 19,880 do 17,	3,379 60
Aqueduct for Shaver's creek,	2,564
	$9,975 60

Mile 101*st*, commences with an embankment across the valley of little Juniata, 15 chains to the river, and Lock No. 41. The ground is 2.43 above. For four or five chains, before arriving at the river, a culvert will be required, for the race of a grist mill. At the beginning of the mile, the bed of the little Juniata is 14 feet below; two chains wide, and must be passed with an aqueduct. This stream can be taken into the canal, as a feeder, at a small expense. Considerable embankment will be necessary, after crossing the stream, for 15 chains; and a culvert will be wanted for the race of a fulling mill. The line then passes over good ground about 34 chains; then a rocky bluff puts in requiring heavy embankment, and wall, in the bed of the river, to the end of the mile.

Excavation, 10,754 cubic yards, at	12,	1,290	48
Embankment, 63,652 do	20,	12,730	40
Wall, 2,243 do	75,	1,682	25
Aqueduct, and two culverts,		2,883	
		$18,586	13

Mile 102*d*. The first part is a continuation of the embankment in the bed of the river, 17 feet below, which continues 16 chains. The earth for embanking this, and the last mile, must be taken from the opposite side of the river, so as to enlarge the channel; the line then passes along steep sideling ground. Soil, gravelly loam and stony, about 32 chains, the remainder is over bottom land, good excavation—soil loam—22 chains through woods.

Excavation 21,684 cubic yards, at	12½,	2,710	50
Embankment, 32,326 do	20,	3,465	20
Wall, 2,243 do	75,	1,682	25
Grubbing,		225	
		$8,082	95

Mile 103*d*. Ten chains from the commencement of this mile, is located lock No. 42. The line then crosses the point of a ridge, with extra excavation, and then continues along the foot of a gentle declivity, on a wide flat of clay, and gravelly loam; good excavation—the line crosses the turnpike, and ends in deep cutting on the margin of the river. Three bridges will be necessary.

Excavation, 30,640 cubic yards, at 13,	$3,983 20

Mile 104*th* passes, for the first part, along the foot of a high rocky bank, requiring embankment in the river. The line then passes along a narrow flat of good excavation, to lock No. 43, and continues a short distance along the side of a gravelly ridge, through woods; the line then passes along in the bed of the river, at the foot of a steep hill of limestone and slate, requiring 16 chains of heavy embankment and wall—the remainder passes on a narrow flat, and ends about the centre of the town of Alexandria. Some embanknient will be necessary along the town.

Excavation, 15,712 cubic yards, at 12,			1,885 44
Embankment, 44,260	do	18,	7,966 80
Wall, 5,236	do	75,	2,427
Grubbing,			250
			$12,529 24

Mile 105th, begins at the town of Alexandria, and passes over flat land; soil, gravelly loam, and some stone—the line crosses the turnpike near the end of the mile. Lock No. 44, on this mile. 8 chains through woods—two farm bridges.

Excavation, 27,368 cubic yards, at 12,	3,420 37
Grubbing,	80
	$3,500 37

Mile 106th, commences at lock No. 45, and passes over good ground for a canal, for the first 48 chains. The line then strikes the turnpike, and runs along the foot of a high hill, and along the turnpike for the remainder of the mile, which must be continued on the bank of the canal next the river, and re-cross at the end of the mile. The west part of the mile will be difficult to excavate; 22 chains through woods—two bridges.

Excavation, 31,936 cubic yards, at 13,	4,151 68
Grubbing,	250 00
Turnpike road,	1,450
	$5,851 68

Mile 107th. The first 24 chains is tolerably good excavation, and passes Spring mill, for which a culvert will be required for the outlet race; some embankment will be required at the mill; the remainder passes along the side of a high rocky hill, where coarse material may be had to form the bank in part, which must be lined with good water tight earth, procured elsewhere; the outside of the bank will run in the bed of the river—woods throughout the whole distance. Lock No. 46, on this mile.

Excavation 26,656 cubic yards, at 13 cents,			3,465 28
Embankment 8,580	do	20 do	1,716
Culvert,			560
Grubbing,			750
			6,491 28

Mile 108th. A part of this mile passes over very good ground; another part is very rocky and will require considerable embankment, and lies altogether through woods. Lock No. 47, on this mile. The whole length is along the foot of a high rocky hill.

Excavation 24,960 cubic yards, at 12½ cents,			3,120
Embankment 9,776	do	20 do	1,955 20
Grubbing,			850
			$5,925 20

Mile 109th Runs through a very narrow pass for the river between the mountains where an embankment must be made for a short distance in the bed of the river, and the earth taken from a narrow flat opposite; the ground continues rocky for a short distance to lock No. 48; the line then passes along a very gentle slope of good excavation, ground covered with laurel bushes; the line passes another limestone point, part of which must be excavated; the last 24 chains is through cultivated fields of gravelly loam.

Excavation 24,815 cubic yards, at		12½	cents,	$3,101 87
Embankment 13,782	do	20	do	2,756 40
Rock 864	do	75	do	634 50
Wall 612	do	50	do	304
Grubbing,				230
				$7,026 77

Mile 110th. The first 40 chains is a little uneven, and has some difficult excavation to lock No. 49; the remainder passes over sandy loam and gravel, easy to excavate; one small brook will fall into the canal. One road and one farm bridge requisite.

Excavation 27,460 cubic yards, at		13	cents,	$3,569 80

Mile 111th Passes along the foot of a ridge of gravelly soil and through woods for the first 24 chains, to lock No. 50, the line then runs over sideling ground, good excavation for the next 48 chains to lock No. 51, the last 8 chains pass a rough point of limestone rock requiring embankment and wall. The bed of the river is 9 feet below.

Excavation 23,934 cubic yards, at		12½	cents,	2,991 75
Embankment 9,392	do	18	do	1,690 56
Wall 960	do	60	do	576
Grubbing,				250
				$5,508 31

Mile 112th Passes over bottom land, along the foot of a steep hill 24 chains, to lock No. 52 at the beginning of a rocky bluff, which continues 31 chains, requiring embankment in the bed of the river 6 feet below, the line then passes near Spong's forge. The remainder is bottom land to the end of the mile, the small stream on which stands Spong's furnace and saw mill, will fall into the canal. A culvert must be made for the outlet race from the forge. The waste water from the forge dam will fall into the canal.

Excavation 16,086 cubic yards, at		12	cents,	1,930 32
Embankment 31,198	do	19	do	5,927 62
Wall 3,960	do	70	do	2,772
Culvert,				450
				$11,079 94

Mile 113th Passes over gravel and sandy loam, 13 chains, to lock No. 53; the line then crosses the head race of the forge, which is 1.44 below, 50 links wide, after which it runs on a flat 2 chains wide, good excavation, nineteen chains, to lock No. 54, at the beginning of a short point of limestone, that will require an embankment in the bed of the river; and wall about 8 chains. The remainder of the mile is good excavation.

Excavation 24,56[illegible] cubic yards, at 13 cents,			3,193 71
Embankment 5,688	do	18 do	1,0[illegible]3 84
Wall 647	do	62 do	40[illegible] 14
			$4,618 69

Mile 114th Is good for a canal the first 32 chains, to lock No. 55; the line then passes along the foot of a high rocky hill in the bed of the river, 9 feet below, 36 chains; some projecting points of rock will require cutting off; the earth for embankment must be taken from the opposite side of the river. The remainder of this mile is good excavation.

Excavation, 14,608 cubic yards, at 12 c.			1,752 96
Embankment, 42,840	do.	at 19,	8,139 60
Wall, 3,274	do.	at 60,	1,964 40
Rock, 934,	do.	at 70,	653 80
		Dolls.	12,510 76

Mile 115th passes over good ground, about thirty-two chains; some extra cutting on the bank of the river, near lock No. 56; then passes over sideling ground—good excavation, thirty-two chains, to lock No. 57; the remainder of the mile will be embankment in the bed of the river, along a very rough, rocky bluff - two bridges.

Excavation, 24,512 cubic yards, at 12 c.			2,941 44
Embankment, 22,[illegible]64	do.	at 18,	4,1[illegible]5 52
Wall, 1920	do.	at 62,	1,190 40
		Dolls.	8,247 36

Mile 116th is nearly all embankment, at the foot of a high hill of limestone, and passes Smoker's forge dam, the surface of which is about level with the bottom of the canal. Lock No. 58, on a small piece of bottom land. The line soon runs into embankment, and continues until within a short distance of the end of the mile; then a few chains of good excavation. There will be some difficulty in obtaining earth for embankment along the line; stone can be easily obtained.

Excavation, 7,968 cubic yards, at 12½ c.			996
Embankment, 43,682	do.	at 21,	9,173 22
Wall, 5,645	do.	at 60,	3,387
Grubbing,			100
		Dolls.	13,656 22

Mile 117th passes over sandy loam soil; easy to excavate for the first twenty-four chains, to lock No. 59; then commences a high rocky hill, requiring an embankment along in the bed of the river, average 6.64 feet below, forty-eight chains; then a narrow flat of stony excavation to the end of the mile; some points of rock must be excavated.

Excavation, 11,84	cubic yards, at 13 c.		1,540 24
Embankment, 50,880	do.	at 20,	10,176 00
Wall, 5,560	do.	at 60,	3,336 00
Grubbing and rock excavation,			475 00
		Dolls.	15,527 24

Mile 118th begins at lock No. 60; the first twelve chains will be embankment and wall, along a limestone ledge in the river; the line then passes over gravelly loam for the remainder of the mile; eighteen chains through woods.

Excavation, 22,576	cubic yards, at 12½ c.		2,822
Embankment, 12,843	do.	at 17,	2,183 31
Wall, 1,440	do.	at 60,	864
Grubbing,			120
		Dolls.	5,989 31

Mile 119th commences at lock No. 61, and passes over very good ground, about sixteen chains; then crosses the road to Williamsburg, at the bridge, and passes along a rocky bank, in the river, 6.29 below; the embankment must be walled sixteen chains. The line then passes over bottom land, twenty-one chains, to lock No 62; the remainder of the mile passes along a high rocky hill, in the river, 10.87 below.

Excavation, 12,284	cubic yards, at 10 c.		1,228 40
Embankment, 54,761	do.	at 18,	9,856 98
Wall, 4,312	do.	at 62,	2,673 44
		Dolls.	13,758 82

Mile 120th. The first twenty chains is a contination of the rocky bluff and embankment; the next fifty-two chains pass over good land, generally gravelly loam, to lock No. 63; the remaining eight chains will be embankment, eight feet below, along a high bank of limestone. A road bridge will be necessary; also some rock cutting.

Excavation,	17,264 cubic yards, at 12½		2,158 00
Embankment,	35,792 do.	at 18	6,474 96
Wall, 3,360	do.	at 62,	2,083 20
Rock, 386	do.	at 70,	270 20
		Dolls.	10,986 36

Mile 121st. The first eight chains will be embankment; the next thirty-two chains is good excavation, with some extra cutting along the bank of the river, to lock No. 64; the residue

of the mile passes through woods; is considerably undulating, and difficult to excavate, being very stony.

Excavation, 27,576	cubic yards, at 13 c.		3,584 88
Embankment, 11,392	do.	at 18,	2,050 56
Wall, 985	do.	at 62,	610 70
		Dolls.	6,246 14

Mile 122d passes twelve chains over a narrow flat of gravel and stone; then ten chains of embankment in the bed of the river, seven feet below, under a high slate hill; a road running along the foot must be raised. The next fifty two chains pass over a narrow flat, gravelly soil; include lock No. 65; then embankment to the end of the mile, 9 feet below.

Excavation, 21,869	cubic yards, at 12½ c.		2,733 62
Embankment, 17,740	do.	at 18,	3,193 20
Wall, 1,536	do.	at 70,	1,075 20
		Dolls.	7,002 02

Mile 123d is a continuation of the embankment for the first sixteen chains, in the bed of the river; the road will require raising. The ground is then tolerably good for thirty-two chains, across a flat; some extra cutting. The line then passes a bluff, and will require the road to be moved, and an embankment about eight chains in the bed of the river; some rock must be excavated; from the bluff, the ground to the end of the mile is good.

Excavation, 12,572	cubic yards, at 12 c.		2,228 64
Embankment, 29,535	do.	at 18,	5,316 30
Wall, 2,160	do.	at 70,	1,512
Road, 8 chains			150
Rock, 557	do.	at 75,	440 25
		Dolls.	9647 19

Mile 124th passes over bottom land, 24 chains, to lock No. 66. Seven chains more, of good excavation, then falls off suddenly to the bed of the river, at a very short bend, and continues a short distance in the bed of the river; then crosses a low flat, covered with heavy timber, 3.68 too low; then runs in the river again, along the foot of a slate rock bank, and crosses the tail race of a saw mill; and also Canoe creek valley—the stream is 6 feet below—the last 49 chains will be embankment.

Excavation,	11,873 cubic yards, at 12,		1,424 76
Embankment,	40,229 do	17,	6,838 93
Wall,	2,433 do	75,	1,824 75
Grubbing,			400
Aqueduct and culvert,			1,586
			$12,074 44

Mile 125th will require embankment in the river at two places, and a wall; a short piece of bottom land between, a little too low. The latter part of the mile passes through a swamp. Considerable grubbing will be necessary on this mile.

Excavation,	13,320	cubic yards,	at 10,	1,132	
Embankment,	31,634	do	18,	5,694	12
Wall,	1,836	do	75,	1,377	
Grubbing,				650	
				$8,853	12

Mile 126th. The first part is a continuation of the swamp to near lock No. 67, after which the ground, for some distance, is gravel and clay, then descends again to another swamp, covered with timber, and a little too low, and crosses the points of two elevations, formed by the washings from the hill—excavation is generally good.

Excavation,	22,343	cubic yards,	at 12,	2,681	16
Embankment,	3,200	do	16,	512	
Grubbing,				725	
				$3,918	16

Mile 127th passes over gravelly and sandy loam, 16 chains through woods, to lock No. 68. About the middle of this mile, six chains of embankment will be necessary at the west end, across a low flat. One bridge will be necessary.

Excavation,	24,568	cubic yards,	at 12,	2,948	16
Embankment,	3,720	do	16,	595	20
Grubbing,				175	
				$3,718	36

Mile 128th has a little embankment at the beginning, after which it passes along the foot of a gentle slope, on an extensive flat. 32 chains lie through woods. Lock No. 69, near the end. One bridge will be required—soil, gravelly loam and clay.

Excavation,	23,212	cubic yards,	at 11½,	2,669	38
Embankment,	4,715	do	16,	754	40
Grubbing,				320	
				$3,743	78

Mile 129th passes over ground similar to the last mile, and crosses the points of two elevations, requiring some extra cutting, which cannot be avoided, except by a very circuitous route—two farm bridges will be necessary.

Excavation,	26,653	cubic yards,	at 11½,	$3,065	09

Mile 130th commences at lock No. 70, and runs 4 chains over gravelly soil, to the bank of the river; then an embankment becomes necessary in the bed of the river, 7 feet below, along the foot of a perpendicular bank of slate rock, about 20 chains; then runs 8 chains across a narrow flat, about level with the bottom of the canal; then another short point requiring embankment, after which the ground is very favourable.

Excavation,	15,738 cubic yards, at	12,		1,888 56
Embankment,	28,643	do	17,	4,869 31
Wall,	2,236	do	75,	1,677
Grubbing;				215
				$8,649 87

Mile 131st begins by embanking past a rocky point, and passes along in the bed of the river, 3 feet below, 20 chains; which pass the village of Frankstown, and crosses a little run that is 2 feet below; then passes over clayey loam soil, 12 chains, to lock No. 71; then passes along parallel with the turnpike, for a short distance; then at the foot of a steep hill, and swampy ground, a little too low, which will require some embankment. Two bridges will be necessary, and considerable grubbing.

Excavation	17,264 cubic yards at	12 cents,		2,071 68
Embankment	16,586	do.	16	2,653 76
Wall	1,622	do.	62	1,005 64
Grubbing,				220
				Dolls. 5,951 08

Mile 132d. The first 24 chains are good for a canal to lock No. 72—the line then crosses the Beaver dam branch of the Juniata, the bed of which is 6 2/3 below, and must be passed with an aqueduct; some embankment will be required at the river; the remainder is good ground; soil, clay loam; this mile ends in the basin proposed for the western termination of the Juniata section; three bridges will be required

Excavation	21,182 cubic yards, at	12 cents,	2,541 84
Embankment	12,220 do.	16	1,955 20
Excavation of basin	16,778 do.	12	2,113 36
Aqueduct,			2,525
			$9,335 40
Feeder 51 chains, from Beaver dam branch, including dam, guard gates, &c.			$1,548
Total amount of excavation, embankment, wall, &c.			928,536 05
74 locks, wood and rough stone, at $1500,			105,000
88 miles of fence,		480,	42,240
80 bridges,		250,	20,000
Feeders,			51,548
			1,147,324 05

Carried forward.

Brought forward,	1,147,324 05
Add for contingencies, 10 per cent.	114,732 40
	1,262,056 45

If stone locks should be adopted, the total amount for constructing the 132 miles of canal, with 594 feet of lockage, will amount to $1,799,956,45

All which is respectfully submitted,

CANVASS WHITE, *Engineer.*

January 30th, 1827.

2d No. 7.

Report of G. T. Olmstead, Esq.

To the Pennsylvania Canal Commissioners.

GENTLEMEN,

The exploraton for a canal and rail-way to form a communication between the Susquehanna and Allegheny river, was continued from the head of the Juniata canal. Not having sufficient time, no regard was paid to a particular location of the rail way; the general route only could be attended, to and reserve sufficient time to locate the canal line down the Conemaugh and Kiskiminitas.

Agreeably to the directions of William Strickland, Esq. I continued the exploration for the rail way to the confluence of Stony creek at Johnstown, where the basin for the termination of the western division of the canal was located; the distance, elevation and depression over the mountain are as follows:

From the Juniata basin to the mouth of Poplar run,	3 miles,	elevation,	33.69 feet.
To Dobbin's farm, 11 miles 31 chains—		elevation,	1311.88 do.
To the summit of the Allegheny mountain, at Bob's creek gap,	13 miles, 72 ch.	do.	1591.39 do.
From Bob's creek gap to the confluence of the South branch of Conemaugh,	14½ miles;	depression,	1050.33
From South Branch to Johnstown,	13 do.	do.	297.67
			1348.00

Making the whole distance 41 miles 32 chains, and the total ascent and descent to be overcome by railway, 2939.39 feet, The banks of the Conemaugh river from the junction of the south branch to Johnstown are high and very precipitious, and bluffs of rocks alternately on either side; it also has a very rapid de-

scent of more than 23 feet to the mile. By the plan now proposed the portage will be 13 miles longer than was originally contemplated, and with the accession of Stony creek, there can be no doubt of a permanent supply of water; perhaps on further investigation, the portage may be made shorter. Considerable time must be spent on the ground to investigate this subject properly.

The examination down the Conemaugh and Kiskiminitas has been confined exclusively to the north bank of the river, and is comparatively the best, particularly when taking into view the advantage of a southern exposure. The line has been located with a strict adherence to a canal navigation, and no insurmountable obstacles have been found to prevent such location, notwithstanding improvements by slack water navigation would perhaps be advisable in some places: it has been suggested that an improvement of the river passing through the Laurel-hill and Chesnut ridge would be the cheapest or best mode to pursue.

There would be no serious objection to a slack water navigation past Laurel hill; the river has a descent of about thirty-two feet in five miles, and could be overcome with two dams, while the Chesnut Ridge has a descent of sixty-four feet in the same distance, and would be more expensive than a canal.

The stone necessary for the construction of locks, can be found principally in the vicinity of the canal; in some places, however, there will be a difficulty in obtaining stone of good quality—the stone required for aqueducts, culverts, bridges, &c. can be obtained at almost any point along the river.

Mile 1*st* commences with the basin at Johnstown, beginning at a bench on a hickory tree, near Livergood's mill dam. The first sixteen chains will include the basin, at the western extremity of which it is proposed to construct a dam across the Conemaugh, of one hundred and seventy feet in length, and ten feet in height, connected with a guard lock on the north side, the whole on a rock foundation. The dam will raise the water to the present level of Livergood's pond; the basin will include about six acres. The next five chains will require embanking along the north side of the river, to the head of an old forge race; the canal will then follow the race eleven chains, which will only require a little clearing out, being of sufficient size. The remainder of the mile passes along the foot of a hill, across bottom land, some distance from the river, and ends in woods. The last four chains will require grubbing.

A feeder of one mile and a quarter, extending from the basin to a point up Stony creek, can be brought in by raising a dam two feet; the first twenty-four chains from the basin will run across the bottom land, above Johnstown, at an average cutting of nine feet; it then meets the creek, and continues along under the bank, which is too high to admit of cutting the whole width of the feeder; on the flat the soil is sandy loam.

Expense for

Excavation	30,160	cubic yards,	in basin, at	13 cents,	3,920 80
Do.	22,600	do.	canal,	8	1,808
Do.	27,840	do.	feeder,	12	3,340 80
Embankment	5,440	do.		15	816
Wall	420	do.		60	252
Dam and guard lock,					2,840
Grubbing,					150

Dolls. 13,127 60

Mile 2d begins in woods, and runs 8 chains to lock No 1, at the side of the road; the bridge must be made above the lock, and the road altered; the line then occupies the road 8 chains to Hausin's run, for which a culvert will be required, and some embankment on each side of the run; the canal will then pass along under a steep gravel bank twenty-four chains to lock No. 2, in the road; for the last twenty-four chains the road runs on the top of the bank fourteen feet above; the bank can be cut off to form the towpath, which will require walling; the next twenty four chains run in the road along the foot of a steep hill in woods; a new road will be required above the canal; the remaining sixteen chains is through cleared fields on bottom land.

Excavation	43,910	cubic yards,	at 8 cents,	3,512 80
Embankment	9,360	do.	15	1,404
Wall	1,434	do.	65	932 10
Grubbing,				465
Large culvert,				750
Making road,				240

Dolls. 7,303 90

Mile 3d. The first sixteeen chains pass over bottom land; good excavation to the bank of the river; it then continues along the foot of the bank twenty-four chains, to Zehelis' farm house; the soil is sandy loam, 18 feet above; a wall will be necessary to protect the bank on the outside; the line then continues on the flat, irregular depth of excavation, to the end of the mile; from the farm-house to the end of the mile, the road should be made along the upper side of the canal, and save the expense of two bridges; two culverts will be required.

Excavation	38,406	cubic yards,	at 8 cents,	3,072 48
Wall	1,920	do.	75	1,440
Grubbing,				100
Two culverts,				625

Dolls. 5,237 48

Mile 4th commences on a flat, near the river, and runs in rear of Brollier's house, 10 chains, to lock No. 3; the line then passes along the point of a sandstone rock, requiring embankment in the river for 11 chains, 9 feet below; then runs on a flat, in woods, to Laurel run, which will require an aqueduct. A bridge will be

necessary for the Laurel hill road. The line continues on the flat 19 chains, to the beginning of Laurel hill; it then passes along the foot of the hill over a very rough, rocky, piece of ground, 24 chains. Some large detached masses of rock must be blasted. The greater part of the last twenty-four chains will be embankment, and the earth taken from the flat opposite; the remaining part of the mile runs on a narrow flat in woods, on stony and undulating surface.

Excavation 18,724 cubic yards, at 9 cents,			1,685 16
Embankment 24,380	do.	18	4,424 40
Rock 856	do.	75	642
Wall 2,108	do.	60	1,264 80
Grubbing,			575
			$8,591 36

Mile 5th. The first eight chains of this mile pass along the foot of a high bank, near the river, to lock No. 4, in the woods. Gravelly soil. The next nineteen chains runs on a flat of tolerably good excavation, and an undulating surface, to where the hill puts up to the river; the line then continues for the remainder of the mile under a high hill, alternately perpendicular rock; and high banks of earth. The most of the earth for embanking must be taken from the opposite bank of the river; a slope wall will be required. Lock No. 5, on this mile.

Excavation 35,400 cubic yards, at 9 cents,			3,486
Embankment 8,810	do.	18	1,585 80
Slope wall 4,060	do.	62	2,517 20
Grubbing,			300
			$7,589

Mile 6th begins at the side of a high bank, and the first twenty-four chains will run partly in the bed of the river; the bank will require walling. Earth can be taken from the bank along the line, calculated as excavation. The line then rises on to a narrow flat, and continues forty-eight chains, through woods, and good excavation; a rocky bluff then begins Lock No. 6, at the beginning of the bluff. The remaining eight chains are under a high cliff of sandstone and slate rock.

Excavation 39,270 cubic yards at 9 cents,			3,534 30
Embankment 17,344	do.	19	3,295 36
Wall 3,112	do.	50	1,556
Grubbing,			528
			Dolls. 8,913 66

Mile 7th. The first four chains is a continuation of the rocky bluff. A high flat then begins, and continues 16 chains; good excavation, and another bluff begins. Occasional points of perpendicular rock throughout the remainder of the mile. The principal part of the earth for embanking, along the last bluff, must be procured on the opposite side of the river. Stone for the wall

conveniently situated along the bank. Lock No. 7, near the end of this mile. Surface of water in the river 4.37 below, after locking.

Excavation 7,196 cubic yards, at	10 cents,		719 60
Embankment 59,410	do.	20	11,882
Wall 6,094	do.	50	3,047
			Dolls. 15,648 60

Mile 8th. The whole of this mile passes along under a high hill. Some earth may be had along the side hill, in places, to form the outside of the bank. There is a high bank of earth opposite will answer for lining. The last twenty chains of the bank must be made in water, about twelve or fifteen feet deep, twelve chains of which passes under the cedar rock, (so called); it is a high cliff of rock, projecting into the water. The river at this point three chains wide. A narrow flat opposite.

Embankment 81,940 cubic yards, at	20 cents,		16,388
Wall 8,231	do.	50	4,115 50
Rock 3,366	do.	50	1,683
			Dolls. 22,186 50

Mile 9th. The first twelve chains continue under the hill last mentioned, to the entrance of Findlay's run, about the end of Laurel hill. At this point a dam of nine feet in height, constructed across the river, at the head of an island, would create a slack-water navigation as far back as lock No. 7, near the end of the seventh mile, thereby avoiding a very heavy embankment and wall. The towing path can be made along the side hill. Findlay's run must run into the canal; the line continues in the bed of the river, along a high bank of rocks, 16 chains, then rises onto a flat and continues twenty chains to lock No. 8 Some detached rock on the surface must be blasted; then good excavation to the end. Fifty-two chains lie through woods.

Excavation 20,642 cubic yards, at	9 cents,		1,857 78
Embankment 22,453	do.	20	4,490 60
Rock 1,260	do.	50	630
Wall 2,429	do.	50	1,214 50
Grubbing,			850
			Dolls. 9,042 88

Mile 10th is good for a canal, until it strikes a steep stoney ridge, and runs a short distance along the side of the ridge, near the margin of the river, then rises on to a flat of good excavation, 64 chains, to lock No. 9, and crosses two small brooks—one will require a culvert; 50 chains are through woods.

Excavation, 30,940 cubic yards, at 9,		2,784 60
Grubbing,		385
Culvert,		545
		$3,714 60

Mile 11th. The first 16 chains pass along on a flat of good excavation, to a brook 5 feet below; it then runs across the head race to Rodger's mill, which is 6.74 below. It can be passed with a large culvert, as also the tail race to the grist mill. The line runs between the saw and grist mill. It would perhaps be better to move the grist mill below the canal. A rocky bluff begins at the mill, and continues to the end of the mile, requiring embankment in the bed of the river—a fine flat on the opposite side will afford stuff for the embankment. Bed of the river, at the mill, 13.54 below—the road along this bluff will require raising. Lock No. 10 on this mile.

Excavation,	6,869 cubic yards, at	10,		686 90
Embankment,	47,457 do	20,		9,491 40
Wall,	5,260 do	50,		2,630
				$12,808 30

Mile 12th begins on a narrow flat, side of the road, and passes along the foot of a low ridge of gravelly loam, on the margin of the river, and rises on to a wide flat, of good excavation, and runs through a piece of swampy ground, some timber; soil is clay and gravel.

Excavation,	24,167 cubic yards, at	8,		1,933 44
Embankment,	3,400 do	16,		544
Grubbing,				150
			Dolls.	2,627 44

Mile 13th passes over good ground for a canal, on a very gentle slope; crosses a small brook where some embankment will be required, and a culvert; soil is gravelly loam—two farm bridges will be necessary.

Excavation,	24,340 cubic yards, at	12,		1,947 20
Embankment,	4,256 do	15,		638 40
Culvert,				536
			Dolls.	3,121 60

Mile 14th. The whole of this mile is through woods. Some deep cutting will be necessary along the margin of the river, near the beginning. Good excavation.

Excavation,	31,600 cubic yards, at	9,	2,844
Grubbing,			940
		Dolls.	3,784

Mile 15th begins in woods, and runs on a gentle slope, for a short distance; then passes through cultivated fields, over a gently undulating surface, consisting of sandy loam. The line crosses a ravine requiring some embankment. A culvert must be made to drain the low ground, above the canal. Two bridges will be required.

Excavation,	24,534 cubic yards, at 8,		1,962	72
Embankment,	3,206 do	15,	480	90
Grubbing,			480	
Culvert,			550	
		Dolls.	3,473	62

Mile 16th runs along the bank of the river, over good ground, 14 chains; then crosses the valley of a small run, 6 feet below, which will require a culvert. Lock No. 14 is located after crossing the run. A rocky bluff begins near the lock. An embankment will be necessary, 30 chains in length, 9.50 below, requiring a wall. A flat then begins, on the margin of which the line continues nearly to the end of the mile. Some grubbing will be necessary.

Embankment,	49,370 cubic yards, at 20,		9,874	
Excavation	14,620 do	10,	1,462	
Wall,	3,646 do	60,	2,187	60
Grubbing,			215	
Culvert,			684	
		Dolls.	14,422	60

Mile 17th is good ground for a canal; the whole distance mostly through woods. One bridge will be required.

Excavation,	26,649 cubic yards, at 8,	2,131	92
Grubbing,	$6 per chain,	480	
	Dolls.	2,611	92

Mile 18th passes over good ground, for 20 chains, to lock No. 15. A short piece of embankment above the lock; then good excavation, until a low bluff puts into the river, which must be embanked; then runs through woods on sideling ground, and stony excavation, to the end.

Excavation,	16,920 cubic yards, at 8,		1,353	60
Embankment,	23,865 do	17,	4.057	05
Wall,	1,576 do	60,	945	60
Grubbing,		$5 per chain,	400	
		Dolls.	6,756	25

Mile 19th crosses a ravine at the commencement, requiring some embankment. Brook 8.86 below, and will require a culvert. The line then continues on gently sideling ground; soil, gravelly loam—mostly through woods, to lock No. 16 near the end of the mile.

Excavation,	25,540 cubic yards, at 8,		2,043	20
Embankment,	4,093 do.	14,	573	02
Grubbing,			400	
Culvert,		$5 per ch.	320	
		Dolls.	3,336	22

Mile 20th. The first 40 chains pass over very good ground, to lock No. 17, at the beginning of a high rocky hill, requiring embankment and wall, in the bed of the river. The remainder of the mile 7 feet below. Stone are convenient for the wall, lying along the foot of the hill, in detached masses; sand stone, substrata of slate, and coal; some rock must be excavated; some grubbing will be necessary.

Excavation,	13,386	cubic yards, at 9,		1,204 74
Embankment,	46,419	do	20,	9,283 80
Wall,	4,110	do	50,	2,055
Rock,	600	do	60,	360
Grubbing,				175
			Dolls.	13,078 54

Mile 21st. The first 16 chains is a continuation of the rocky point. The line passes over an undulating, stony piece of ground, to lock No. 18, and crosses Richard's run, which is 4 19 below, and can be taken into the canal; then passes along a sand stone ledge, to the end of the mile; some rock must be excavated. The whole of this mile lies through woods.

Excavation,	21,626	cubic yards, at 9,		1,946 34
Embankment,	15,300	do	18,	2,754
Rock,	540	do	60,	324
Wall,	1,420	do	50,	710
Grubbing,			$6 per chain,	480
				$6,214 34

Mile 22d. The first 40 chains continue along the foot of a perpendicular ledge of rock, through thick laurel bushes. Mostly embankment in the bed of the river. Considerable difficulty will be found in obtaining good material for embankment. Crosses Laurel run, 13 feet below—may be taken in, or passed under, the canal. The line then crosses the point of a ridge, which projects into the river, and will require 4 chains, deep cutting, principally sandstone, to lock No. 19. Then good excavation to the end of the mile—considerable grubbing.

Excavation 13,935 cubic yards at 9 cents,	1,254 15
Embankment, 62,452 cubic yards, at 20 cents,	12,490 40
Rock, 1,806 cubic yards, at 75 cents,	1,354 50
Wall, 4,580 cubic yards, at 50 cents,	2,290
Grubbing at 5 dollars per chain,	480
	$17,869 05

Mile 23d. The first eleven chains pass over good ground, in woods, to the beginning of Chesnut Ridge, and to lock No. 20. The next thirteen chains run along the foot of a rocky hill; then pass over bottom land, twenty-four chains, to lock No. 21. The remainder of the mile passes along a rocky hill, in the bed of the river, and will require heavy embankment and wall.

Excavation, 7,674 cubic yards, at 10 cents,	767 40
Embankment, 75,510 cubic yards, at 20 cents,	15,102
Rock 592 cubic yards at 50 cents,	296
Wall, 6188 cubic yards, at 62 cents,	3,094
Grubbing,	400
	$19,659 40

Mile 24th passes, for the first thirty-two chains, along the foot of a rocky hill, requiring embankment in the river, and wall. Lock No. 22. The remainder passes over stony ground, for a short distance; then sandy soil to the end of the mile. Considerable grubbing. Some rock must be excavated.

Excavation 16,307 cubic yards, at	10 cents,		1,630 70
Embankment 41,916	do.	20	8,383 20
Wall 3,804	do.	50	1,902
Rock 980	do.	60	588
Grubbing, at 5 dolls. per chain,			400
			$12,903 90

Mile 25th commences at lock No. 23, and passes over good ground for a canal, about thirty-two chains. Sandy soil, to lock No. 24. Some heavy oak timber. The remainder of the mile runs along a high hill, with large, loose rock at the base. Embankment in bed of river, eight feet below.

Excavation, 10,679 cubic yards, at	10 cents,		1,067 90
Embankment 50,883	do.	19	9658 27
Rock 340	do.	50	170
Wall 4,856	do.	50	2,428
Grubbing,			475
			Dolls. 13,799 17

Mile 26th. The first twelve chains are a continuation of the embankment and wall. The line then passes over bottom land—tolerably good excavation, through woods, to lock No. 25; then begins another bluff, requiring embankment in the river, to the end of the mile.

Excavation 12,360 cubic yards, at	11 cents,		1,359 60
Embankment 47,945	do.	19	9,109 55
Wall 5,254	do.	60	3,152 40
Grubbing,			546
			$14,167 55

Mile 27th. All but about twelve chains of this mile, will require embankment in the river, along a mill pond, 4.77 below; water from two to six feet deep. Lock No. 26, near the beginning of the mile. The line crosses Tom's run, which must be passed under the canal. Some excavation on the west end of the mile.

Embankment,	81,400	cubic yards,	at 20 cents,	16,280 00
Excavation,	4,283	do,	at 12	513 96
Wall,	7,068	do.	at 60	4,240 80
Culvert for Tom's creek				875 00
				$21,909 76

Mile 28th passes, for twenty-four chains, over very good ground, to Brown's saw mill, where a bluff commences. Lock No. 27, at the beginning of the bluff; then 36 chains of embankment, six feet below, earth for which must be taken, in part, from the opposite bank. The remainder of the mile passes over bottom land. Some rock excavation will be necessary. Two bridges will be required.

Excavation,	16,540	cubic yards,	at 10,	1,654
Embankment,	34,100	do.	at 20	6,820
Wall,	3,220	do.	at 60	1,932
Rock,	660	do.	at 75	495
				$10,901

Mile 29th. The first thirty two chains pass over bottom land, to a high bluff, (called Alumn Bank,) where an embankment, thirteen feet below, will be necessary for about twenty four chains. The river makes a short turn at this point, and is quite narrow; and during high water, a strong current sets against this shore, where the canal will be much exposed to ice and drift wood. A good foundation will be found for lock No. 28, after passing the bend, located in this point. Some projecting points of rock must be cut off. After passing the lock, the embankment will be nine feet below.

Embankment,	77,540	cubic yards,	at 20 cents,	15,508
Excavation,	10,637	do.	at 9	957 33
Rock	811	do.	at 75	608 25
Wall	5,728	do.	at 60	3,436 80
				$20,510 38

Mile 30th. A few chains of the beginning of this mile will require embankment, in the river; then passes over bottom land. Soil, gravelly loam. A short piece of extra cutting, on the bank of the river, about the middle of the mile, will be necessary. Two bridges will be required.

Excavation,	23,790	cubic yards,	at 12½	2973 75
Embankment,	10,610	do.	at 16	1,697 60
Wall	846	do.	at 60	507 60
				$5,178 95

Mile 31st. The first 15 chains to lock No. 29, the ground is a little too low, and will require some embankment; the line then passes over good ground, 48 chains, to lock No. 30, at the beginning of a rocky bluff near Blairsville, which continues to the end

of the mile, which terminates a little below the turnpike bridge the wing walls of which can be taken down, and the canal pass above the abutment, the road being of sufficient height to admit of a bridge over the canal without altering its level.

Excavation 19,263	cubic yards, at	9	cents,	1,733 67
Embankment 21,350	do	18	do	3,843
Wall 1640	do	60	do	984
Rock 654	do	70	do	457 80
Grubbing,				400
				$7,418 47

Mile 32d Commences at Blairsville, and with the exception of two short pieces of narrow bottom land, an embankment in the bed of the river will be necessary the whole distance, from 6 to 12 feet below.

Embankment 85,184	cubic yards, at	20	cents,	17,036 80
Excavation 5,342	do	10	do	534 20
Wall 6,426	do	60	do	3,855 60
				$21,426 60

Mile 33d Passes for twenty-four chains over a narrow piece of bottom land; some small undulations; then a high bluff of rock, requiring an embankment of twenty-four chains, 12 feet below to lock No. 31; the line then passes over bottom land near the river, and good excavation to the end. One road bridge for this mile.

Excavation 18,676	cubic yards, at	9	cents,	1,680 84
Embankment 42,190	do	18	do	7,594 20
Wall 2,826	do	60	do	1,695 60
				$10,970 64

Mile 34th Passes over very good ground for a canal, except a short bluff requiring about five chains embankment in the bed of the river ten feet below; crosses some small ravines, one of which will require a culvert. Considerable grubbing will be necessary. One farm bridge required.

Excavation 24,968	cubic yards, at	9	cents,	2,247 12
Embankment 6,704	do	16	do	1,072 64
Wall 666	do	60	do	399 60
Grubbing,				280
Culvert,				746
				$4,745 36

Mile 35th Commences with with a piece of deep cutting, and continues about twelve chains over very steep sideling ground; some rock will be met with in the bottom of the excavation; the line then continues in the road on a narrow bank to Black Lick creek, which will require an aqueduct of two hundred feet—sur-

face of water eighteen feet below and about two feet deep. Lock No. 32 is located on the north bank of the creek, the ground is then good about sixteen chains, where a bluff begins, requiring embankment in the bed of the river to the end of the mile. Two bridges will be necessary.

Excavation 20,760 cubic yards, at		9	cents,	1,868 40
Embankment 40,748	do	19	do	7,742 12
Do 10,629	do	13	do	1,381 77
Wall 3,411	do	60	do	2046 60
Rock 1264	do	75	do	948
Aqueduct over Black Lick,				3,475
				$17,461 89

Mile 36th Is a continuation of the embankment in the river, and continues about half a mile. Some large loose rock must be removed; lock No. 33, on a narrow undulating flat, which continues about thirty chains; then another bluff of slate and very compact sand stone the remainder of the mile.

Embankment 92,936 cubic yards, at		20	cents,	18,587 20
Excavation 7,910	do	8	do	632 80
Wall 6,408	do	60	do	5,844 80
Rock 800	do	70	do	560
				$25,624 80

Mile 37th Passes for twenty four chains along the last mentioned bluff, requiring embankment and wall; the line then crosses the point of a high flat, and about twelve chains of extra cutting will be incurred on the present line, but can be avoided by a more circuitous route, the excavation is, however, good, and will serve for embankment; the ground then descends suddenly to a lower flat, across which the ground is good for a canal.

Excavation 25,860 cubic yards, at		8	cents,	2,068 80
Embankment 31,440	do	18	do	5,659 20
Wall 2,894	do	62	do	1,794 28
				$9,522 28

Mile 38th Crosses a road and a small brook near the beginning; a bridge and culvert will be required. Lock No. 34 is located near the brook; the line then passes along a rocky bank in the bed of the river about twenty chains, then passes over a narrow flat and crosses Altman's run, which is 10.70 below, and must be passed with an aqueduct; the line then passes along another bluff which extends to the end of the mile.

Excavation 9,418 cubic yards, at		8	cents,	753 44
Embankment 61,810	do	19	do	11,743 90
Wall 5,650	do	60	do	3,390
Culvert,				475
Aqueduct,				1,565
				$17,927 34

Mile 39th Will require a heavy embankment along the base of a very high and rocky hill throughout, from twelve to sixteen feet below.

Embankment	156,060	cubic yards, at	20 cents,	$1,212
Wall	11,243	do	50 do	5,621 50
				$36,833 50

Mile 40th. The principal part of this mile passes along gentle sideling ground; some distance through woods; over an undulating surface. Good excavation.

Excavation	25,290	cubic yards, at	8 cents,	2,023 20
Embankment	4,357	do	16 do	697 12
Wall	540	do	50 do	270
Grubbing, five dollars per chain,				400
				$3,390 32

Mile 41st Passes over very good ground for a canal—a short piece of extra cutting will be necessary near the middle of the mile, which cannot be avoided; a culvert will be required to pass a small brook. The greater part of this mile is through woods. Lock No. 35 on this mile—some embankment requisite near the lower end, and some rock excavation.

Excavation	24,098	cubic yards, at	9 cents,	2,168 82
Embankment	5,244	do	16 do	839 04
Rock	1,216	do	75 do	912
Grubbing, five dollars per chain,				400
Culvert,				540
				$4 859 86

Mile 42d Passes over stony undulating ground on a narrow bank for the first half, to lock No. 36, then runs at the foot of a high hill of slate, sand stone and bituminous coal, requiring embankment and wall in the bed of the river.

Excavation	14,369	cubic yards, at	12 cents,	1,724 28
Embankment	58,420	do	19 do	11,099 80
Wall	4,874	do	60 do	2,924 40
Grubbing,				480
				$16,228 48

Mile 43d passes along the side of a very rocky and narrow flat, too high for the canal, but will afford some earth for embankment for about half the distance; then runs on gently sideling ground, and crosses a point of loose rock, and continues along the side of a steep gravelly ridge, to the end of the mile: some grubbing required.

Excavation,	15,450	cubic yards, at	9 c.	1,390 50
Embankment,	72,300	do.	at 18,	13,014
Rock,	1,890	do.	at 75,	1,417 50
Wall,	5,142	do.	at 50,	2,571
Grubbing,				250
			Dolls.	18,643

Mile 44th passes along the side of a steep gravelly ridge, near the river: about half a mile tolerably good excavation; then runs on a gentle slope of good excavation to the end.

Excavation, 26,694 cubic yards, at 9,	$2,402 46

Mile 45th passes over good ground for a canal, about thirty-four chains, and through woods. The line crosses a ravine and brook, 10 below: will require some embankment and a culvert; crosses a public road. Lock No. 37 near the west end of the mile.

Excavation, 23,706 cubic yards, at 8,	1,896 48
Embankment, 5,485 do. at 14,	818 30
Culvert,	875
Grubbing,	340
	$3,929 78

Mile 46th runs over sideling ground, and crosses a ravine, requiring embankment and a culvert; then continues, at the foot of a steep hill, on a flat, which is little too low, to lock No. 38; the line then passes a brook, and over good ground, to the end of the mile.

Excavation, 24,940 cubic yards, at 9 c.	2,246 60
Embankment, 3,087 do. at 14	432 18
Two culverts,	1,230
Grubbing,	1 0
	$4,028 78

Mile 47th. The first fifteen chains pass over good ground; an embankment of three chains will be requisite. The next thirty-six chains will be heavy embankment, along a rocky bank, in the bed of the river, 14 feet below; some rock must be excavated; the remainder is favorable.

Excavation, 15,900 cubic yards, at 10.	1,590
Embankment, 63,840 do. at 18,	11,491 20
Wall, 4,427 do. at 50,	2,213 50
Rock, 682 do. at 60,	409 20
Culvert,	375
	$16,078 90

Mile 48th runs along a gentle slope, near the margin of the river, to lock No. 39; then continues in the road, and crosses a ravine, four chains wide, three feet below; a little extra cutting after crossing the ravine. Soil, gravelly loam and small stone.

Excavation, 31,200 cubic yards, at 8,	2,496
Embankment, 2,130 do. at 14,	298 20
Culvert,	536
	$3,330 20

Mile 49th. The first thirty-two chains pass over good land to a ravine and road; the remainder of the mile passes in the road, between a high hill and the river, and very stony.

Excavation, 25,580 cubic yards,	at 9 c.		2,302 20
Embankment, 5,376 do.	at 15,		806 40
Culvert,			487
Forty-eight chains of road,			525
			$4,120 60

Mile 50th passes over very rough stony ground, along the foot of a rocky hill; for half the distance it will be necessary to excavate some rock and alter the road. The remainder is good ground for a canal; some timbered land; some embankment on the first part. Lock No. 40 near the west end of the mile.

Excavation, 20,350 cubic yards,	at 9 c.		1,831 50
Embankment, 7,624 do.	at 15,		1,143 60
Rock, 1217 do.	at 75,		912 75
Thirty-two chains of road,			450
Grubbing,			480
			$4,817 85

Mile 51st passes over tolerably good ground for thirty-two chains; then an embankmeut of twenty-four chains, to pass a bluff point; surface of water thirteen feet below; the remainder of the mile passes over undulating ground covered with timber.

Excavation, 16,844 cubic yards,	at 9 c.		1,515 96
Embankment, 34,916 do.	at 18,		6,284 88
Wall, 3,084 do.	at 60,		1,850 40
Grubbing,			245
			$9,896 24

Mile 52d begins on the south bank of Black leg's creek, sixteen feet below, requiring an aqueduct of one hundred feet. A feeder can be taken from the creek, within one quarter of a mile; lock No. 41 located eight chains from the creek. A culvert will be necessary, to pass the tail race of a saw mill. The line then runs at the foot of a high gravelly bank, about 7 chains; then passes along a high rocky bank, in the bed of the river, thirty-two chains; the remainder of the mile passes over uneven ground covered with timber.

Excavation 15,620 cubic yards,	at 9 cents,		1,405 80
Embankment 54,600 cubic yards,	at 18 cents,		9,828
Wall 4,140 cubic yards,	at 50 cents,		2,070
Aqueduct, & culvert,			2,470
Grubbing,			380
			$16,153 80

Mile 53d passes over undulating ground, soil, gravelly loam; crosses three ravines, two of which will require culverts and some embankment; some grubbing necessary.

Excavation 25,274 cubic yards, at 8 cents,	2,021	92
Embankment 3,310 cubic yards, at 14 cents,	463	40
2 Culverts,	975	
Grubbing,	220	
	$3,680	32

Mile 54th. The first twenty-four chains are good for a canal to lock No. 42; then an embankment, mostly in the bed of the river, along the foot of a high rocky hill, the remainder of the mile; river ten feet below.

Excavation 8,269 cubic yards, at 10 cents,	826	90
Embankment 59,430 cubic yards, at 20 cents,	11,886	
Wall 5,618 do. 60	2,809	
	$15,521	90

Mile 55th. The first eight chains are a continuation of the bluff; then a narrow flat commences, with extra cutting, about thirty-two chains; the remainder of the mile passes along a high rocky hill, in the bed of the river, 18.75 below. The line passes Rumbach's ferry road, where a bridge will be requisite.

Excavation 16,462 cubic yards at 9 cents,	1,481	58
Embankment 66,643 cubic yards at 19 cents,	12,662	17
Wall 5,821 do. 50	2,910	50
	$17,054	25

Mile 56th crosses Routing run, about seventeen chains from the commencement, which will require a culvert of considerable size, sixteen feet below. The line then passes over bottom, twelve chains; the remainder passes over stony ground, between a high rocky hill and the river; some timber.

Excavation 33,526 cubic yards, at 8 cents,	2,682	08
Rock 914 do. 75	685	50
Culvert for Routing run,	1,260	
Grubbing,	330	
	$4,957	58

Mile 57th continues along the rocky hill. Surface of ground undulating, with some rock excavation. Lock No. 43, near the commencement; the last twenty-two chains pass along a limestone ledge, in the river, 12.75 below. Salt works on top of bank, passed without injury.

Excavation 24,480 cubic yards, at 8 cents,			1,958 40
Embankment 26,674	do.	18	4,801 32
Rock, 1,239	do.	75	929 25
Wall, 1,911	do.	50	955 50
			$8,644 47

Mile 58th passes for a short distance over very good ground; then follows the road on the side of a steep hill, and passes two salt works, which must be removed, and the road made on the side hill above the canal, the excavation of which will afford material, together with the excavation of canal, to form the bank; a greater portion of the material is perous, and will require lining with good water-tight earth. The river along this point is narrow.

Excavation 27,349 cubic yards, at 9 cents,			2,461 41
Rock, 1,216	do	75,	912
64 chains of road,			768
			$4,141 41

Mile 59th passes over ground similar to the last. Some places of good excavation. Three salt works to be removed. Some solid rock must be excavated. The canal will occupy the road the whole of this mile.

Excavation 30,620 cubic yards, at 9 cents,			2,755 80
Rock, 1,410	do	75,	1,057 50
80 chains road,			960
			$4,773 36

Mile 60th. This mile is gently undulating, and tolerably good excavation; passes four salt works, in line of canal, and which must be moved. This mile will occupy the road. Some grubbing necessary.

Excavation 27,264 cubic yards, at 9 cents,	2,453 76
80 chains road,	960
Grubbing,	350
	$3,763 76

Mile 61st commences near the head of the big-falls, and at eight chains crosses Roaring run, ten feet below. Lock No. 44, on the bank of the run; the line then passes over undulating ground, occupying the road in some places. Some embankment is necessary. By constructing a dam at the head of the big-falls, sixteen feet above low water, it would set back to about the middle of the fifty-eighth mile, thereby obviate the necessity of removing the salt works, along this margin of the river, and secure to the salt works, on both sides of the river, within that distance, an equal advantage of the navigation.

Excavation,	18,614 cubic yards, at 9 cents		1,675, 26
Embankment,	14,760 do.	at 16	2,361 60
Aqueduct for Roaring run,			1,280
Grubbing, at 6 dollars per chain,			480
Thirty-two chains of road,			320
			$6,116 86

Mile 62d, passes over uneven ground for the first thirty-two chains, to lock No. 45, and crosses a ledge of rock five feet above, one chain wide; the ground is then good, and crosses a ravine two chains wide, four feet below, requiring a culvert.

Excavation	25,850 cubic yards, at 9 cents		2,326 50
Embankment	1,436 do.	14	201 04
Rock	470 do.	75	352 50
Culvert,			535
			Dolls. 3,415 04

Mile 63d is generally favorable for a canal. Soil, sandy loam and gravel; some timbered land. The line crosses two ravines, requiring embankments and culverts. Passes the village of Warren.

Excavation,	26,696 cubic yards, at 9 cents,		2,402 64
Embankment,	1,248 do,	at 14	174 72
Grubbing,			365
Two culverts,			975
			$3,917 36

Mile 64th passes over very good ground, principally through heavy timbered land, and crosses a ravine about the middle of the mile, six chains wide, 5 feet below, then continues along the foot of a steep ridge to lock No. 46. Sixteen chains of embankment in the bed of the river, fifteen feet below, after passing the 64th mile to join the feeder, (as it is now called,) on continuation of the canal down the Kiskeminetas.

Excavation,	24,614 cubic yards, at 9 cents,		2,215 26
Embankment,	34,960 do.	at 18	6,292 80
Culvert,			850
Grubbing,		at 6	480
			$9,838 06

In addition to the above estimate, should be added forty-six locks, of eight feet lift each, at six hundred dollars per foot, if constructed of stone, and fifteen hundred dollars per lock, if wood; also thirty-five bridges, with stone abutments, and superstructure of wood, at two hundred and fifty dollars each.

RECAPITULATION.

Total amount for excavation, embankment, &c.		654,124 93
363 feet of lockage, at 600 dollars per foot,		220,800 00
35 bridges,	250,	8,750 00
32 miles of fence,	480,	15,360 00
		899,034 93
Add for contingencies, 10 per cent.		89,903 49
	Dolls.	988,938 42

If the locks are built with wood and rough stone, the constructing of sixty-four miles of canal, with forty-six locks, would amount to $836,138.

All of which is respectfully submitted,

GEO. T. OLMSTEAD,
Assistant Engineer.

January 30, 1827.

No. 8.

Extract from the minutes of the board in relation to the North Branch survey.

Philadelphia, Sept. 12, 1826.

A letter and report from James Geddes, Esq. upon the survey of the northern route, were read.

Resolved, That a committee of three be appointed to consider the report of Mr. Geddes, upon the survey of the northern route.

Messrs. Lacock, Enoch and Mowry, were accordingly appointed.

Philadelphia, Sept. 13*th*, 1826.

The committee, to whom was referred the report of Mr. Geddes, on the survey of the northern route, reported as follows:

"That the conclusion of Mr. Geddes seems to them to be warranted by the facts he has stated, and it may, therefore, be assumed as certain, that a navigable communication cannot be affected by the West Branch and Sinamahoning: there is a summit of considerable length, which cannot be adequately supplied with water."

"This point, which was the principal object of inquiry, being thus ascertained, it became a question, whether it was necessary, at this time, for Mr. Geddes to pursue the location further; that is, to follow the line of Clarion river to its junction with Allegheny river. He represented, that the next forty miles from the spot where he had stopt, would be through a wilderness, entangled with a heavy growth of laurel and

brush, where it would be impossible to transport their provisions by a wagon, or by horses, and where they would be obliged to cut a road for themselves, at great expense, through the whole distance, the streams being too low for transportation by water. In this state of things, he asked for further directions, intimating, at the same time, his own opinion, that the work in that quarter had reached its natural termination."

"The president, with the concurrence of Dr. Patterson, the only commissioner he could consult, directed Mr. Geddes to desist from that part of the work until the further order of the board; and proceeding to the Allegheny river, at Foxburg, to follow the line thence to the neighborhood of the mouth of the Kiskeminetas, so as to unite with the canal below. This forms part of the line from Pittsburg to lake Erie, and has never yet been examined."

"Under the circumstances stated, it appears to the committee, that it is unnecessary, at this time, to incur the expense of labor and money that would be required for continuing the location along the Clarion river. The existence of an insuperable obstacle to a continued water communication, by that route, is rendered certain by what has been done, and a location to the westward of the impediment, would throw no additional light upon the matter. It may, nevertheless, be satisfactory at some future time, (during the present season,) when a rise of the water shall afford facilities, and Mr. Geddes, or other suitable person can be spared for the purpose, to have the levels taken, and the distance measured down the Clarion river, so as to give a general view of the advantages and disadvantages of that line, and to point out the manner in which the navigation may be best improved. This will be very useful in settling a plan of improvement in that direction."

"The committee therefore offer the following resolutions:"

Resolved, That the directions given to Mr. Geddes, by the president, on the 2d day of September, instant, be, and the same are hereby approved and confirmed, and that Mr. Geddes be informed accordingly.

Resolved, That after finishing the location from Foxburg to Kiskeminetas, Mr. Geddes be directed to proceed to locate a canal along the remaining part of the Allegheny river; that is to say, the part which lies between Foxburg and French creek, so as to connect with the work below, observing the general directions in the president's letter of the 2d September.

Resolved, That Mr. Geddes be directed, as soon as may be practicable, after finishing the work on the Allegheny, to proceed to the examination along the Clarion river, from the point where he has stopped, taking the levels and distances and communicating fully his views as to the best mode of improvement; and if he should find, that he will not be able to proceed to that work, during the present season, that he be directed to inform the board, in order that arrangements may be made for having it executed.

The foregoing report and resolutions, having been read, were unanimously agreed to.

No. 9.

Report on the upper level of the eastern division of the Pennsylvania canal, by William Strickland, James Geddes, N. S. Roberts, and Canvass White, engineers, in the service of the board.

To the President of the Board of Pennsylvania Canal Commissioners.

SIR,

Agreeably to the resolution of the board of canal commissioners requesting their engineers to confer, and report their opinions upon the upper level of the eastern division of the canal, and upon the necessity of erecting a dam in the Susquehanna; the undersigned have taken these subjects into consideration, and in consequence of the great depression of the water in the river, at the place from whence it is to be taken, are of opinion that this level ought to be raised, and continued to a point at the upper reef of Foster's falls, near Clark's ferry, where a dam of three feet in height should be constructed across the Susquehanna, in order to give a proper depth of water for the passage of canal boats; and that an opening should be made through the dam, of sufficient width, in a right line with the channel, for the passage of the river craft; which opening should be so guarded with a wing wall, above and below the dam, as to afford an easy access to and through the outlet, upon a slope of about six inches in the 100 feet.

We are of opinion that a dam so constructed would not interfere with or obstruct the natural navigation of the river.

WILLIAM STRICKLAND,
JAS. GEDDES,
NATHAN S. ROBERTS,
CANVASS WHITE.

Harrisburg, Feb. 1, 1827.

No. 10.

Resolution of the board of canal commissioners to extend the eastern division of the Pennsylvania canal, to a point at the upper reef of Foster's falls, near Clark's ferry, and raise the level thereof, approved by the engineer, and consented to by the Governor.

At a meeting of the canal commissioners of Pennsylvania, held in the borough of Harrisburg, on the 3d day of February, 1827, it was

Resolved, That the location of the eastern division of the Pennsylvania canal, as fixed by resolution of 19th June last, be altered, by raising the upper level thereof, to the necessary height, and continuing it up the Susquehanna, to a point at the upper reef of Foster's falls, near Clark's ferry; and that application be made to his excellency, the governor, to consent to this alteration.

I certify the foregoing to be a true copy from the minutes of the board.

JOS. M'ILVAINE, *Sec'ry.*

February 3, 1827.

I approve of the alteration, as made by the foregoing resolution.

WILLIAM STRICKLAND.

February 3, 1827.

I consent to the extension and alteration of the eastern division of the Pennsylvania canal, as determined upon by the foregoing resolution of the board of canal commissioners, and approved of by the engineers.

J. ANDW. SHULZE.

Harrisburg, February 5, 1827.

No. 11.

Report of the committee appointed to superintend the subject of releases, on the proposed lines of communication between the eastern and western waters.

The committee appointed in May last, to employ an agent to procure releases from land holders, on the several contemplated canal routes, beg leave to report:

That, in compliance with their appointment, they employed John Steinman, of Harrisburg, for that purpose, at the price of one dollar and fifty cents a day, he to bear his own expenses. He was furnished with the proper authority and instructions, and commenced his labors on the 20th of May, and closed them on the 20th of November last. He has returned into our hands a fair and full record of his proceedings, with all the releases which he procured, properly executed, which are herewith submitted to the board. His account for services done, is also rendered, which it is desired may be examined and paid.

A. LACOCK,
C. MOWRY.

December 8, 1826.

Report of J. Steinman on releases.

Releases taken on the Susquehanna, West branch, Driftwood branch, and the Sinemahoning, on the east side of the mountain and on the west side the Clarion river, and Toby creek, and Allegheny river, 99
French creek and Allegheny river, 21

120

Releases taken on the Juniata river, and on the Conemaugh and Kiskeminetas river, and on the mountain, 120

Total amount, 240

Appointed by the canal commissioners on the twentieth day of May, 1826, and proceeded up the Susquehanna river to the West Branch, and up the same to the Sinemahoning, and up the same to the Driftwood Branch, and up the same to John Earle's; thence up the Allegheny mountain to Job Carr's, near the summit of the mountain; thence down the mountain, on the west side; thence down the Clarion river or Toby's creek, to the mouth; thence down the Allegheny river to the mouth of the Kiskeminetas; thence up the same, to the mouth of the Conemaugh; thence up the same to Thomas Croyle's; thence up the river to mouth of Ben's creek; thence up the same to the summit of the Allegheny mountain; thence down the mountain to the Beaver dam branch of the Juniata; thence down the Juniata to the mouth; thence up the Susquehanna river, on the east side, to Milton. From thence up the Juniata river, and down the Conemaugh and Kiskeminetas, to the mouth; thence up the Allegheny river and French creek, to the fall in French creek, known by the name of M'Guffin's falls; thence down said French creek to the outlet of Conneaut; thence down French creek to the mouth of the Kiskeminetas, and returned from services rendered the commonwealth, on the twentieth day of November, being one hundred and eighty three days, at one dollar and fifty cents per day, amounting to Dolls. 274 50
Printing, stationary and other contingent expenses, 18 75

Dolls. 293 25

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Mathew Carey

Second Edition—March 14, 1827.

TO THE CITIZENS

OF THE

COMMONWEALTH OF PENNSYLVANIA.

INTERNAL IMPROVEMENT.

Every citizen of this state, who has its honour and prosperity at heart, must read with the most sincere pleasure, Mr. Lehman's Report on Internal Improvement, and the Report of the Canal Commissioners, which present such sound and magnificent prospects of the future greatness of Pennsylvania. The liberal policy which so honourably characterized the last legislature, if followed up by their successors, with the same spirit, of which a doubt cannot be entertained, must in a few years enable the state to regain the ground she has lost, and place her in as high a rank in this confederacy as she actually occupies in point of natural advantages, particularly in the great mineral treasures, salt, bituminous and anthricite coal and iron, in which, undoubtedly, she is not exceeded, perhaps hardly equalled, by any portion of the globe, of the same extent. Those treasures are in value infinitely beyond mines of gold and silver.

The system adopted in both these reports, is perfectly sound and just, and the only one that afforded a reasonable prospect of success —that is, consulting the interests of the different great sections of the state, and letting them advance *pari passu*. Thus is concentrated a mass of influence and power, which will bear down all opposition. Any other system would be as impolitic as unjust, and would unite so formidable a combination of hostile elements as would risque, probably insure, a defeat.

It is to be regretted that there are citizens, happily but few, who, notwithstanding the great advantages accruing to our state from the internal navigation, already but partially accomplished—and the immense benefits derived by New York from her splendid works, are still opposed to internal improvement on a grand scale, on the ground of the heavy debt it will create. There might have been some plausibility in this objection some years back, when the canal system was in embryo here—and when New York had to encounter an expenditure of nearly ten millions of dollars in an undertaking, of which the most disastrous results were confidently but erroneously predicted. But it requires a most extraordinary degree of inveterate prejudice, to close our eyes against the strong light, which, for two or three years, successful practice has so copiously shed on the subject.

In order to enable the reader to form a tolerably accurate idea of the operations on the New York canals, and their rapid advancement in usefulness, I request his attention to the following table.

A Synoptical View of the total expenditure on the New York Canals—the interest paid on the sums borrowed to effect them—together with the amount of tolls collected, to the close of the year 1826.

	Expenditure.		Interest.		Tolls.	
	$	$	$	$	$	$
1817	200,000		6,000			
1818	460,900		16,250			
1819	587,467		38,836			
1820	668,900		70,927			
1821	1,120,500		123,672		2,200	
1822	1,955,012		190,948		44,488	
Totals for six years.		4,992,779		446,633		46,688
1823	1,784,102		209,297		119,988	
1824	1,275,543		442,041		289,320	
1825	990,537		409,884		566,279	
1826	603,882		421,673		771,780	
		4,654,064		1,432,895		1,747,367
Totals for ten years		9,646,843		1,939,528		1,794,055

This table possesses uncommon interest. It cannot be too carefully studied by Pennsylvanians generally, and more particularly by our legislature at the present moment, when, to their credit, the paramount object of the internal improvement of the state, justly occupies so large a portion of their attention. It presents various highly interesting views on this important subject.

I. It appears that New York, in the first six years, expended the enormous sum of $ 4,992,779 on her canals, and paid $ 446,638 interest, and in that time received only $ 46,688 for tolls.

II. Yet that the tolls already received are within $ 145,000 *of the whole amount of interest paid from the commencement of the works!*

III. That the *tolls for the last four years, exceed the amount of interest paid within that period, about* 25 *per cent.*

IV. That they increased in three years, from 1823 to 1826, nearly seven fold—that they doubled in one year, from 1824 to 1825—and increased nearly forty per cent. from 1825 to 1826.*

V. That those of last year were ninety per cent. more than the amount of the interest paid in that year, and were more than 50 per cent. of all the interest paid in nine years, from the year 1817 to the close of the year 1825.

It is to be observed, that from these tolls are to be deducted the expenses of the canals for repairs and for attendance; viz. for collection, $ 30,000—ordinary repairs, $ 100,000—new feeders, locks, bridges, securing banks, and other improvements, $ 130,000, principally on the Champlain canal. Only a portion of the last item can be correctly considered a permanent charge.

* The traffic and tolls on the Schuylkill canal increased in the last year three fold beyond their extent in 1825—notwithstanding the obstructions which took place at various times, and arrested the intercourse for two and three weeks at a time—obstructions which there is reason to hope will never occur again.

These details bear ample testimony to the wisdom, foresight, and public spirit of the Clintons, the Van Renssellaers, the Coldens, and the other patriotic citizens, who, in spite of a most violent and unappeasable opposition, created this source of boundless prosperity and happiness, for which their memory will be blessed by remote posterity. But it is easy to prove, that, however immense the advantages of New York, and whatever prosperity she has derived from her canals, Pennsylvania enjoys an incalculable superiority over her as regards internal improvement, in various points of view, and that of course our inducements to march boldly in this noble career are of the most powerful kind. If New York had the magnanimity to venture on enterprizes unexampled in the history of the world, so far as their extreme magnitude is concerned, let us not hesitate to copy her illustrious example, when they are crowned with complete success.

That state laboured under great disadvantages. Competent engineers were scarce—many of the contracts were made at most extravagant rates—and, owing to the inexperience and want of knowledge of the commissioners, some expensive alterations of their plans were inevitable. In a word, if the work were to be done now, it could be executed at half or two-thirds of the actual expense. We can avail ourselves of the knowledge for which the New York commissioners paid so dear.

New York, as we have seen, expended enormous sums, on which, for six years, the tolls did not amount to one per cent. Whereas, as soon as the Pennsylvania Canal is completed to Lewistown, which will open the Philadelphia market to the iron and coal mines of Huntingdon and Centre counties, tolls will be immediately collected, probably to the amount of six per cent. on the capital then invested. This part of the canal, 41 miles in extent, will, according to the recent report, cost only about $ 245,000, and probably be completed in the course of next year; and it would not be very extraordinary, considering the immense extent of the iron and coal trade, which it will create, if the tolls, after two years, were to pay the full amount of the interest on all the loans as they are progressively made.

I proceed to a brief enumeration of some of the advantages Pennsylvania possesses over New York on the subject of internal improvement.

I. Our canals, of 500 miles, are estimated to cost only $ 5,000,000,* very little more than half the expense of the Erie and Champlain canals, of 427 miles.

II. As our canals will only cost about half, if the tolls are the same,

* As this estimate may appear too low, I think it proper to state some strong facts, derived from the report of the Chesapeake and Ohio canal convention, just published. General Lacock has offered to undertake 100 miles of the Chesapeake and Ohio canal for $ 1,000,000—and the remaining 186 miles for $ 2,500,000, being an average of $ 12,225 per mile—and pledged himself to furnish ample security. It is obvious that he must have calculated on large profits to induce him to engage in such a weighty undertaking. Further, "A survey and estimate has been recently made by an experienced engineer "in New York, of a canal to unite the Alleghany river in Pennsylvania, with "the New York canal, 102 miles in length, with a lockage of 13 feet to the "mile, which is estimated to cost $ 5886 to the mile." These facts, it is presumed, are conclusive in favour of the estimate of our canal commissioners.

our surplus, beyond the payment of interest and expenses, will be above three fold greater than that of New York. *E. G.* Suppose the tolls $ 750,000—New York interest, $ 420,000—expenses, $ 260,000—surplus for sinking fund, $ 70,000. Pennsylvania interest, $ 250,000—expenses, $ 260,000—surplus, $ 240,000.

III. As our canals will afford dividends on a respectable scale, at an early period, we shall probably require but little other revenue to pay the interest on the loans.

IV. As there appears to be neither coal nor iron on the Erie canal, and no coal on the Champlain, and as these articles, which furnish the chief support to canals, are to be found in the course of our canals, to a boundless extent, the tolls from our own productions will probably be fifty, perhaps one hundred per cent. more than those of the New York canals from the same source.

V. A careful examination of the map of the western states, has fully proved, that of one million and a half of their inhabitants, who will seek a market in the Atlantic states, two-thirds will find our great canal more convenient than the Erie canal.

VI. Our canals will be navigable two or three weeks earlier in the spring, and later in the fall, than those of New York. These, it is well known, are the seasons in which transportation most abounds, and when, of course, time is most valuable. A week in spring or fall for the country merchant, is worth a month in summer.

Let it not be supposed that my object in presenting these views is to depreciate the advantages of the New York canals, or to disparage the efforts of those by whom they have been brought to maturity, and maintained in their present prosperous state. Far from it. I merely wish to place in strong relief the superior advantages we enjoy, and the imperious duty of our legislature, to themselves—to their cotemporaries—and to posterity, to let escape no rational means, to secure the manifold blessings with which they are pregnant.

The New York Canal Commissioners disbursed last year out of the canal fund, $ 188,445 towards the completion of the Oswego canal. And they propose to appropriate this year, out of the same fund, $ 330,000 " to complete the Cayuga and Seneca canal." Thus these great works, besides the blessings they so copiously dispense to the contiguous country, will spread prosperity in every direction, by aiding to extend the grand system of internal improvement throughout the state. The commissioners estimate the tolls of the present year at $ 850,000, which will probably be realized, as all their past estimates have been exceeded by the actual receipts.

These tolls will, at no distant day, form a sinking fund for the redemption of the debt created for the completion of the canals, and ultimately support the government, and relieve the state from the burden of taxation. Such, with equal certainty, and with far more rapidity, will be the result of our canal system. "*A consummation devoutly to be wished.*" Let every good citizen respond "*Amen.*"

M. C.

Philadelphia, March 6, 1827.

E. L. 6.
Myers D. M. M'Blain
Pittsburgh
Pa

REPORT

OF THE

COMMITTEE ON INLAND NAVIGATION AND INTERNAL IMPROVEMENT,

RELATIVE TO

RAIL ROADS AND CANALS.

Penn.— General assembly

Mr. LEHMAN, Chairman.

Read in the House of Representatives, February 26, 1829.

Harrisburg,

PRINTED AT THE OFFICE OF THE REPORTER.

1829.

REPORT, &c.

Mr. Lehman, from the committee on inland navigation and internal improvement, to whom were referred the various documents relative to rail roads and canals, made

REPORT:

That the time has arrived when the great work of internal communication has become acceptable to the interests of all classes of the community, and has so far advanced towards completion, and the benefits it will confer are so generally admitted, that arguments in favor of its policy are now superfluous.

Pennsylvania gave birth to the turnpike and canal system in America, and she now perceives the policy of spreading, by means of canals and rail roads, the basis of strength, and unfolding her immense capability of improvement. It may be said that our whole country under the powerful stimulus of free institutions, exhibits the spectacle of twenty-four states striving to augment the mass of industry, wealth and population, and to preserve for their own benefit the largest share of the trade which springs from such increased prosperity. Among the Atlantic states, the maxim is now adopted that not only manufactures and agriculture, but a seaport with an extended home and foreign trade, are among the elements of prosperity. The struggle for commerce kindles a noble spirit of industry and emulation—awakens genius—and by calling forth all the resources of the states, gives strength and greatness to the whole confederacy.

Under the law of last year the state is pledged to form by its own means,

1st A complete communication between the city of Philadelphia on the Delaware, and the city of Pittsburg on the Ohio, by means of rail roads and canals.

2d. A branch of the canal from the mouth of the Juniata, on the Susquehanna, to the New York state line.

3d. A branch from the Susquehanna to the Bald Eagle, on the West Branch.

4th. A canal from Carpenter's point to the tide-water, on the Delaware.

5th. A navigable feeder for the contemplated canal between Pittsburg and lake Erie.

6th. A rail road from Columbia to the town of York.

The steady and (so far as is consistent with economy of expenditure) the rapid advancement of the entire system of improvement is now the obvious policy of Pennsylvania; and it is the duty of the committee to communicate the to House, the result of their anxious inquiries, in relation to the sum of money which ought to be provided for the present year, and the objects to which the money ought to be applied.

It is proposed in the bill annexed to this report, to vest some discretionary powers in the commissioners, so far as respects the rail roads and canals, which are authorised to be put under contract. No maxim of prudence or economy, it is thought, will be violated, if it is left to their discretion and responsibility, to advance at such places and with as much speed as is compatible with the means within their control, the interest of the commonwealth and the restrictions of the law. It is presumed, that no difference of opinion will now exist in relation to the policy and the true economy of bringing to a speedy completion the line between the Delaware and the Ohio, and also the branches on the Susquehanna and the Delaware. All this has been promised by the law; and upon the faith of the law, enterprising citizens in every direction, have made arrangements and entered into contracts, with a view of participating in the advantages which such improvements never fail to confer upon an industrious population. So far as respects the great work alluded to, it may be said, that its construction is the settled policy of the state. and what remains for the present and future legislatures. is to secure a careful superintendence and an economical expenditure of the public money.

In addition to the improvements recognised by existing laws as part of the Pennsylvania system, the committee have made provisions for advancing with all practicable speed towards the great canal of the state of Ohio, and also towards lake Erie. The completion of these works is deemed essential to the full usefulness and grandeur of the scheme of improvement. The importance of connecting lake Erie with the Delaware, is illustrated by the rapid increase of the commerce of our inland seas. A few years ago ten vessels were sufficient for the trade of lake Erie, and now there are seven large steam boats and upwards of one hundred coasting vessels. They have also directed active operations to be commenced upon the Monongahela; and if practicable, upon the rail road between Columbia and York, and also between Harrisburg, Carlisle and Chambersburg. These improvements, it is believed, will be productive in the shape of tolls, and are due to the wishes and interests of the fertile counties on the southern border. In the bill, the committee have made provisions for examinations and estimates, with a view of connecting the canal with the river, both at Derrstown, on the West Branch, and at Harrisburg on the Susquehanna.

In framing the bill, the committee have adopted the principle of accommodating all the districts of the state as early as possible. The result may be, that the state will receive tolls at a later pe-

riod, from some parts of the line of communication; but it is obvious, that from other parts the receipt of tolls will be earlier.

The opinion has been advanced, that all the energies of the state ought, in policy, to be concentrated to the main route between the Delaware and the Ohio, and that thereby it may the more speedily be brought to completion. This, however, would infringe the principle of mutual accommodation, which has received the legislative sanction, and is now regarded as essential to the preservation of the public faith. It is also believed that active operations may be carried on in many parts of the state to a certain extent, without retarding in any great degree the accomplishment of the main line. Experience has proved, that in every district labourers may be found who will work in their own neighbourhood, but will not travel to a great distance from their homes. These may be employed in the advancement of interesting parts of the work, without any serious detriment to other parts which may be deemed more important to the general interests of the commonwealth.

Embarked as Pennsylvania is in a system, of which the rich results cannot be fully enjoyed until all the parts are completed, it is the dictate of wisdom and true economy not to stay the hand of improvement, but to complete the whole with all practicable speed.

For the vigorous prosecution of the work, the committee propose to appropriate the sum of 3,200,000 dollars.

If the magnitude of this sum excites apprehension, it will be recollected that the money will be spent within our own limits, and will be an active, moving, diffusive capital; giving employment to our own people, stimulating industry and ingenuity, and producing arts, improvements and inventions. It will in many ways be conducive to prosperity, independent of the advantages the public will derive from the improvements. The cost of the work cannot ultimately be any burden upon the finances of the state, as the income to be derived will reimburse the expense. All the facts in relation to the soil and mineral riches of Pennsylvania, concur to prove that the expenditures to be made will be a judicious investment. The work will pay for itself. It is not necessary to repeat arguments which have heretofore convinced the understandings of the people and of their representatives. Some interest, however, may be excited, by facts recently ascertained in our own country, on which a judgment can be formed of the amount of income to be derived from tolls. The committee are aware that the vast sums invested in turnpike stock have been unproductive, and that the receipts generally have been consumed by repairs. Such, however, will not be the result of the canal system.

The tonnage conveyed on the Schuylkill canal, within the last year, was 105,463 tons, and the tolls and water rents amounted to nearly 100,000 dollars. This work has but recently been finished, and the result has been thus encouraging, although its beneficial influence upon the productive industry of the country, is as yet felt in a very imperfect degree. The Union Canal is also full of promise, though it will not be completed until the ensuing

spring. The delay may be ascribed to the difficulty of carrying canals across a dividing ridge, a difficulty which no where exists on the line of the Pennsylvania canal. An imperfect navigation, however, existed for a few months during the last year; and such is the creative power of a canal upon our industrious population and fine country, that with a few boats 18,000 tons were passed and the tolls paid, amounted to $26,000. The Lehigh navigation was interrupted during a great part of the past season, by the construction of works for securing an ascending navigation; the company, however, were enabled to bring from the mines 33150 tons of coal. The Erie and Champlain canals have been finished but a short time, and the tolls paid into the New York treasury, already amount to more than three millions of dollars. Last year there was a failure of the crop of wheat, which forms the great staple of that state, the tolls nevertheless were $833,000. This sum with a sufficient permanent allowance for superintendance and repairs, is adequate to paying the interest on the cost of the works, and leaves a large sum to be applied to the extinction of the debt.

If such are the happy results of the works of improvement above alluded to, what may not reasonably be expected after the completion of the Pennsylvania canal? Wheat will be as abundantly raised in our state as in New York, but coal and iron will be the great staples, and they constitute in all countries the most valuable tonnage for canals.

It cannot reasonably be apprehended that any difficulty will exist in procuring all the money on loan. The dividends on bridge and turnpike stocks, the collateral inheritance tax, and a portion of the auction duties are already set apart as a fund for the regular payment of the interest. All the tolls arising from the canals and rail roads are pledged, and some idea may be formed of the tolls which will spring from the streams of inland trade, by the fact, that the contractor for the great dam on the Kiskeminitas, who has finished his work, and who is a responsible man, offers by petition to pay $10,000, for the privilege of navigating four boats, toll free, for half a year, from Blairsville to Pittsburg. The Lehigh navigation and coal company, also in their official report, state the interesting fact, that tonnage is already waiting on the Lehigh, sufficient at a moderate rate of toll to produce a handsome income to the state, on the Delaware division of the Pennsylvania canal.

It may truly be observed that each successive year developes new views in relation to the rich treasure Pennsylvania has in coal. A recent memorial from the Lyceum of Natural History in New York states, the amount paid within one year for fuel for domestic purposes and steam boats in the city of New York, at $2,400,000. Governor Clinton in his last official message remarks, that New York is compelled to resort to the coal of Pennsylvania; and he says the quantity which will be wanted for that state, is estimated at two millions of tons. It has now become obvious that coal will constitute the chief article of fuel, not only in the city and state of

New York, but in many parts of all the states on the seaboard. Coal has become an object of vast national importance, and it will soon be a part of the public policy of many states of the union, to facilitate the means of procuring it from the mines of Pennsylvania. The legislature of Delaware but a few days ago, incorporated a company for the object, as stated in the law, "to furnish a cheap supply of mineral coal to the manufacturers and people of this state, to be derived from the immense stores of this valuable material which abound in the neighbouring state of Pennsylvania." Our state may proudly say, that the bounty of nature has made her mountains the grand repository of this precious mineral, and also of iron; and every ton which is extracted from the mines will be tributary to her wealth and greatness, and will aid in making the Pennsylvania canal more productive in tolls, than any other canal in the United States.

The committee would dwell with emphasis upon the foregoing considerations, because they show the revenue the canals will produce, and the security the public creditor will have, that his interest will be paid and his capital refunded, and the right Pennsylvania has to expect that the loan will be taken either at home or abroad upon favorable terms.

The commissioners of the canal fund state, in their report made a few days ago, that by transferring the estimated balance, which will be in the treasury in 1830, to the canal fund, there will be a sufficiency after defraying all the ordinary expenses, to meet the interest of the present debt, together with the interest which will be incident to the new loan now proposed, of three millions of dollars. It has been suggested, that to satisfy the prudent and the timid, it may be expedient to establish some additional sources of revenue, and the subject is now under the consideration of the finance committee of the House. But it does not appear that there is reasonable ground for believing, that any additional taxation will be necessary.

Public credit rests upon a sure basis in Pennsylvania. Where is the state possessing more resources or more integrity? Our riches in the products of the soil and the mines, and in the acquisitions of personal property, are almost untouched for state purposes. Practical schemes of finance can never be wanting, and the public faith will be pledged to establish sufficient revenue. The ability and patriotism of the people no man can doubt, and a wise government will never sacrifice its character for punctuality and good faith. It is believed that measures may be resorted to for facilitating the sale and transfer of stock, and steps taken for sending stock to Europe, and that it may there be sold to advantage. The committee believe, that in the pursuit of this object, the state may be assisted by some of the existing banks; and that both patriotism and interest will prompt the bank of Pennsylvania or other banks, to afford facilities to the government in obtaining pecuniary aids.

In the contemplation of the financial situation of Pennsylvania, the committee cannot overlook the fact, that from the national

treasury, which is the common property of the people of the United States, five millions might annually be distributed among the states, without embarrassing the national finances, or preventing the speedy extinguishment of the national debt, or interfering with any expedient or just operation of the national government. It is believed that after the lapse of a few years the annual distribution may be ten millions of dollars. The first mentioned sum would entitle Pennsylvania to $ 600,000, or the interest on twelve millions of dollars. The last mentioned sum would give the interest on twenty-four millions of dollars. A bill for the accomplishment of this object is now pending before the national legislature; and the house has requested our representatives in congress to promote its adoption. The committee do not allude to this financial resource as of certain reliance; but in conjunction with the funds already set apart and the sure receipt of ample tolls, it holds out the cheering prospect that the noblest monument of genius and power may be accomplished, and the public engagements be met, and the high character of Pennsylvania for good faith be maintained, without additional taxation, and with the certainty that whatever is regarded as odious in our financial system, may soon be expunged.

It is believed that the sale of water power along the line of canal will soon become a financial resource of some importance. and that legal provisions ought to be made for the accomplishment of this object. This, with other interesting matters under consideration, and embracing some objects of improvement, will constitute the subject of another report.

In conclusion, the committee will remark, that the genius of William Penn recognised the policy of navigable communications in Pennsylvania more than half a century before a canal was constructed in his native country; and our predecessors, the inhabitants of the land which he planted, were the first among the members of the American family who run a level or measured waters with a view to canal navigation. It has now become our imperative obligation to keep pace with the march of human improvement. All the states around us are active and circumspect, and seeking not only to unfold their own riches, but to attract to their own territory the commerce of the western states. There is a necessity of exertion, if we are to keep our relative position in the confederacy, or to be lifted to the high station within our reach. Our state is the centre of the United States, and distinguished beyond all others for its mineral wealth. It has the tide of the Delaware on the east, the waters of the Ohio and of the lakes on the west, and is blessed with benignant skies and a prolific soil. Under the influence of a wise legislation, mental and physical improvement will advance hand in hand. The riches of the soil, and of the mines, and of the mind, will be fully explored and developed, and Pennsylvania will be the fairest portion of our happy country.

MESSAGE

FROM

THE GOVERNOR,

ACCOMPANIED WITH

THE REPORT

OF

THE CANAL COMMISSIONERS,

RELATIVE TO THE

PENNSYLVANIA CANAL AND RAIL-ROAD.

Read in the House of Representatives, December 18, 1829.

HARRISBURG.

PRINTED BY WELSH & MILLER.

1829.

REPORT, &c.

To the Senate and House of Representatives of the Commonwealth of Pennsylvania.

GENTLEMEN:

I herewith transmit to the Senate and House of Rperesentatives, a copy of a letter from the president of the board of canal commissioners, together with their report, made conformably to law, and the documents accompanying the same.

GEO. WOLF.

Harrisburg, December 18, 1829.

CANAL COMMISSIONERS OFFICE,

Harrisburg, December 18, 1829.

His Excellency GEORGE WOLF,
Governor of Pennsylvania.

SIR,

By order of the canal commissioners of Pennsylvania, I have this day signed their annual report, and have the honor of presenting it herewith to your excellency, with accompanying documents.

Very respectfully, sir,
Your obedient servant,
DAVID SCOTT,
President of the board of canal commissioners of Pennsylvania.

The Canal Commissioners of Pennsylvania, respectfully submit the following Report:

The act to provide for the commencement of a canal, to be constructed at the expense of the state, and to be styled the Pennsylvania canal, was passed on the 25th of February, 1826. This act contained an appropriation for the purpose, of $300,000. To this sum the legislature has added, since that period, by annual appropriations, $6,000,000, making the whole sum appropriated, for canal and rail-road purposes, $6,300,000. In addition, there has been placed to the credit of the treasurer of the board, the loans negotiated by the Governor since the first of October last, to meet the pressing demands upon some of the divisions, amounting to $106,000.

The whole distance of the Pennsylvania canal, authorised to be constructed by the several acts of assembly, and placed under

contract prior to the first of June, 1829, is 419½ miles. Nine miles have been placed under contract since that period, making the whole distance now under contract, 428½ miles, viz:

From Pittsburg to Johnstown,	104	miles.
From the mouth of the Juniata to Smith's mills, above Huntingdon,	90	
From Middletown to Muncy hills, upon the west branch of the Susquehanna, and including ten miles placed under contract between Middletown and Columbia,	100	
From Northumberland up the north branch of the Susquehanna to Nanticoke falls,	55	
From Bristol to Easton,	60	
From Bemus's mill, on French creek, to Muddy run,	19½	

Of this distance 195 miles are navigable, viz:

From Pittsburg to the head of the dam at Blairsville,	75	miles.
From the mouth of the Juniata to Lewistown,	45	
From Middlestown to Clark's ferry,	24	
From the mouth of the Juniata to Northumberland,	41	
On the French creek feeder,	10	

A great portion of the remaining 233½ miles is nearly finished, and the whole is in a state of rapid progress to completion.

The sum required to pay the debts due upon the respective divisions of the canal, according to the reports of the acting commissioners and superintendents, is	$1,398,790 67
And the whole amount of work, of every description, yet to be done upon the several divisions, as estimated by the principal engineers, is	2,060,742 39
The amount already expended, is	6,406,000 00
	$9,865,533 06

Of which sum, there has been paid $47,132 73½ for damages, and $95,000 upon the Pennsylvania rail-way; leaving $9,723,400 33 expended, and to be expended, in the construction and completion of 428½ miles of the Pennsylvania canal, including the expenses of the board of canal commissioners, and the daily pay and salaries of the acting commissioners, superintendents, engineers, and other agents.

The cost of this immense public work, will be found, upon comparison, not to exceed in any material respect, the cost of similar works in this country, and although it presents a formidable sum, when viewed separately from the beneficial effects it is calculated to have upon the value of land, the trade, the industry, and the enterprize of the citizens of the commonwealth; yet, when viewed in connexion with those great and enduring benefits, policy and the best interests of the state, pronounce it a necessary and judicious expenditure. Regarded only as an investment of funds, it presents satisfactory inducements to the most eager lover of gain.

When the connexion between the eastern and western waters shall have been completed, Pennsylvania will present to the trade of the western country, an avenue to the Atlantic coast, equal, if not superior, to any which has been, or can be constructed; besides, her own manufactures and agricultural products, which will seek a market through the canal, are equal in amount to those of any other state, independently of her coal, iron, salt and lumber, which in tonnage, must exceed all other articles transported to market.

The Erie canal, extending from Albany to Buffaloe, 363 miles, yielded toll in the year 1828, to an amount upwards of $2,000 per mile. Now, if the New York canal, before its advantages can be said to have been fully developed, yielded in one season upwards of $2,000 per mile, what will be the amount of toll upon the Pennsylvania canal, where, in addition to all the tonnage which can seek a market in the state of New York, we have iron to an immense amount, and coal, which alone, surpasses all calculation?

But the advantages of this great public work, are not to be measured by the interest it will yield upon the money expended; it adds an intrinsic and permanent value to the commonwealth, independently of the profits arising from tolls. Facts existing in our own state, abundantly prove, that the additional value of the territory bordering upon canals, more than equals the whole amount expended in their construction. It is believed, and the belief rests upon practical results, that the owners of the soil in Schuylkill county, before the canal to Philadelphia was made, would have advanced their private interest by making the improvement at their own expense, the additional value to their lands arising from the canal, would have exceeded in amount the whole cost. If we apply such facts to the Pennsylvania canal when extended through the inexhaustible anthracite coal fields of the North Branch; the iron and bituminous coal region of the Juniata and West Branch, to the Pennsylvania salt works, and affording facilities for the transportation to Philadelphia, of the immense coal tonnage of the Lehigh and other branches of the Delaware, and opening avenues for the commerce of the rich vallies of the Ohio, the Mississippi, and the extensive regions bordering upon the lakes of the north and north west, independently of the manufactures and agricultual products which every where surround this improvement, the certain result, while it must flatter the pride, will multiply the wealth, strengthen the physical force and increase the moral influence of the state.

With these views in relation to the subject, the board can have no hesitation in recommending the vigorous prosecution of the great system of improvement, as heretofore marked out by the Legislature; a system perhaps as perfect as could be projected, to develope and bring into activity the resources of the state, and to unite every section of this great commonwealth in one common bond of interest and of feeling.

The sums appropriated for canal and rail road purposes, have been expended upon the several divisions, as follows:

From Pittsburg to Johnstown, 104 miles, including $5,242 39½ cents paid for damages,	$2,036,264 61
From the mouth of the Juniata to Smith's mills above Huntingdon, 90 miles, including $6,729 25 paid for damages,	1,130,477 81
From Middletown to Muncy hills, upon the West Branch of the Susquehanna river, and including ten miles placed under contract, between Middletown and Columbia, 100 miles, including $22,300 29 paid for damages,	1,944,302 18
This includes that portion of the Pennsylvania canal which is now comprised in the eastern division, and the Susquehanna and west branch division; Mr. Mowry having had under his care at one period, the eastern and Susquehanna divisions, the expenditures were blended.	
From Bristol to Easton, 60 miles, including $6,526 82 paid for damages,	476,338 92
From Northumberland up the north branch of the river Susquehanna, to Nanticoke falls, 55 miles, including 2,464 07 paid for damages,	425,265 55
From Bemus' mill, on French creek, to Muddy run, 19¼ miles, including $3,800 62 paid for damages,	209,603 72
Pennsylvania rail way, the road formation of forty miles having been placed under contract, including $69 29 paid for damages,	50,000 00
The late board paid under the act of 24th March, 1828, for surveys and explorations,	19,757 23
The present board received on account,	2,000 00
The commissioners of the internal improvement fund have paid engineering expenses, &c. to the amount of $5,990 00, which sum was refunded out of the canal fund,	5,990 00
	$6,300,000 00

To which sum must be added, the late loans made by the Governor, expended as follows:

Upon the Pennsylvania rail road,	45,000
Juniata division,	25,000
North Branch division,	10,000
Susquehanna division,	20,000
French creek feeder,	6,000
	$ 106,000

The amount due for work done upon the several divisions under contract, and the estimated cost of work yet to be done, are ac-

cording to the reports of the acting commissioners and engineers, as follow :

Western Division :	
Debts due,	114,737 26
Amount of certificates issued,	140,340 99
Estimated cost of work to be done,	351,280 91
Juniata Division:	
Debts due,	148,664 66
Amount of certificates issued,	241,368 61
Estimated cost of work to be done,	693,582 55
Eastern, Susquehanna and West Branch Divisions :	
Debts due,	144,122 51
Amount of certificates issued,	150,383 88
Estimated cast of work to be done,	296,301 13
Delaware Division:	
Debts due,	40,676 93
Amount of certificates issued,	141,353 11
Estimated cost of work to be done,	335,576 25
North Branch Division:	
Debts due,	62,450 29
Amount of certificates issued,	167,000 00
Estimated cost of work to be done,	225,855 00
French Creek Feeder :	
Debts due,	26,260 00
Estimated cost of work to be done,	45,000 00
Pennsylvania Rail-way:	
Debts due,	16,468 38
Amount of certificates issued,	4,964 05
Estimated cost of work to be done upon the 40 miles road formation under contract,	113,146 55½

From this review and estimate, it appears that there is now due upon the several divisions of the Pennsylvania canal, under contract, the sum of $1,399,790 67, for $845,410 64 of which certificates have been issued. That the amount of work to be done upon the several divisions of the canal and rail road, now under

contract and in progress of completion, as estimated by the principal engineers, is $2,060,742 39½. The nature of these demands upon the commonwealth, requires that they should be promptly liquidated. A moments reflection will show that unrewarded labour, to so large an amount as is now due, brings upon the enterprising contractor inevitable ruin, and deprives, particularly at this season of the year, a valuable portion of the community of their only means of subsistence.

Owing to the delays and interruptions incident to a work of this magnitude, the finished portions of the canal were not prepared for navigation until late in the season; by letting in the water the work was tested, and the weak points were ascertained; the work generally has fully answered the expectations of the board. Repairs in many instances have been made, and every precaution has been taken by the respective acting commissioners and superintendents, to guard against accidents, and secure the permanency and usefulness of the canal. Small sums have been received as toll upon the western and eastern divisions. The navigation has hitherto been more a matter of experiment than a regular business, but it has confirmed the opinion entertained of the ultimate value and utility of this great public work. It is believed the amount of tolls which will be received within the ensuing year, on the divisions of the canal now navigable, may be fairly estimated as follows:

On the Western division,	$30,000
Juniata division,	13,000
Eastern division,	10,000
Susquehanna division, including the bridge at Duncan's Island,	12,000
	$65,000

It is obvious, that an immense increase must ensue from the completion of other lines connecting the improvements, and from new channels of trade being established.

The powers which the canal commissioners now possess, are limited to a general superintendency, management and direction, in the location and construction of canals and rail roads; the appointment of officers and agents for that purpose, and the adjustment of claims for damages, &c. and when any part of the Pennsylvania canal shall be finished and in a state for navigation, they may appoint collectors of tolls and fix their location, and order and direct the rates of toll. It will be apparent, that with such limited powers, it is impossible for the board to adopt any code of rules and regulations applicable to the complicated and various transactions connected with the navigation of the canal and the collection of tolls. A rule or regulation which cannot be enforced is worse than useless. The board have no power to enforce any regulation by penal sanctions.

Near 200 miles of the canal will be navigable at the commencement of the next season, and the greatest part of that contracted for, will be navigable during the next summer, if means are provided to carry on the work. Hence the legislature will perceive the necessity of adopting a system of regulations and penalties, concerning the navigation of the canal and the collection of toll; the views of the board upon this subject are expressed in a system of rules accompanying this report.

The provisions in relation to damages, require legislative revision. As the law now stands, the feelings and prejudices of the country through which the improvements pass, too often constitute the only standard by which damages are measured, a standard uncertain and unequal, as it relates to individuals concerned, and frequently unjust as it regards the commonwealth. It is respectfully recommended to the legislature, to provide for the appointment of appraisers by the executive, who shall receive and decide upon all applications for damages done to real property, in consequence of the construction of the Pennsylvania canal or rail road, and who shall in their estimate, take into consideration the advantages and disadvantages of such improvements to the whole real estate of the individual claiming damages, wherever situated, with the right of appeal to either party to the supreme or circuit court.

Upon nearly all the divisions of canal, it is believed there is at various points, and particularly at and near the feeder dams, a very large amount of surplus water, which might be advantageously applied to hydraulic purposes: as no adequate provision has been made for the sale of such surplus water, and as it is believed that a very considerable revenue may be annually derived from this source, the expediency and propriety of making provision for the sale of hydraulic privileges, is most respectfully suggested.

The present canal commissioners met, in pursuance of the act by which they were appointed, on the first day of June 1829.—David Scott was appointed president, and Francis R. Shunk, secretary.

For the measures adopted by the board upon its organization, in the appointment of acting commissioners and superintendents, upon the several divisions of the canal and rail road, the appointment of principal engineers, and the arrangement of their different corps, and the fixing the compensation of the various officers, agents and persons employed in the service of the state, reference is made to the journal of the board which accompanies this report, as required by law.

The balance of the appropriation for canal and rail road purposes, made by the legislature, at the last session, and not expended by the late board, was found to be $1,407,704 30, which sum was received by the present board and its agents, during the past season, in the following proportions.

James S. Stevenson, upon the Western division,	$214,305 99
James Clarke, Juniata division,	305,336 40
John Forrey, jr. Eastern division,	163,282 32
John Ryon, jr. Susq. and W. Branch division,	232,175 14
Thomas G. Kennedy, Delaware division,	206,338 92
John Mitchell, North Branch division,	189,265 53
William Dickson, French Creek feeder,	45,000 00
John Barber, Pennsylvania rail way,	50,000 00
The board of canal commissioners,	2,000 00
	1,407,704 30

As a material portion of this sum was applied to the payment of debts then due, the balance was found to be entirely insufficient to enable the board to meet the expectations of the legislature, in prosecuting the public works during the season, as required by the provisions of the act of the 22d of April last.

On the fifth of July, the president of the board received a communication from Messrs. Blythe and Mahon, members of the board of internal improvement, informing him that the board had no funds at their disposal, for canal and rail road purposes, and that demands to a considerable amount had been presented by the acting canal commissioners and superintendents, which had not been met, for want of funds. In pursuance of this information, the president convened the board of canal commissioners on the 28d of July. As temporary loans had been obtained to meet the demands upon the treasury, prior to the meeting, and as the board then had reason to believe that no material embarrasment in the prosecution of the public works would be experienced, whilst any portion of the sum appropriated for that purpose remained unexpended, they urged the several acting commissioners and superintendents to employ such force, and apply such funds as would secure the most exposed portions of the public works, and bring early into operation the divisions of canal which were nearly completed.

At the meeting in October, it was found that the funds appropriated for canal and rail road purposes, had for some time, been insufficient to meet the sums due monthly by the commonwealth, to contractors, and that the acting commissioners and superintendents were under the necessity of granting certificates to such contractors, as evidence of the amount due to them respectively.—At this trying period, the board anxiously solicitous to preserve the public works, to save the meritorious contractors from inevitable ruin, and to promote the best interests of the commonwealth, recommended to the respective acting commissioners and superintendents, to prosecute the works upon their respective lines, without remission, and to continue until the meeting of the legislature, on the first Tuesday in December, to make the usual monthly estimates, and to give to each contractor, or person entitled to receive payment, a certificate of the amount due such per-

son. The certificates, a form of which was prescribed, to be signed by the acting commissioners and superintendents, and countersigned by the clerks upon the respective divisions. These measures had a tendency to lessen the evil consequent upon a deficiency of funds, and have enabled the board to continue the prosecution of the public works, up to the present period, without any material remission. For the redemption of these certificates, at the earliest possible moment, the most confident reliance is placed upon the justice of the legislature, in providing the requisite means; and as no acting commissioner or superintendent, can, under the existing laws, draw from the treasury more than 50,000 dollars at any one time, it is respectfully submitted, whether the interests of all concerned, will not require additional facilities for the prompt redemption of such certificates, upon the different divisions, whenever the necessary funds shall be provided.

As some of the divisions of the canal were so situated as to require immediate funds for the preservation of the works, and for guarding against the disastrous consequences of the frost and floods of the approaching season, and as there was reason to believe that sums adequate to the emergency, might be obtained from monied institutions or individuals friendly to the internal improvement of the state, on condition, that the same should be expended upon divisions designated, the constituted authorities were requested by the board to negociate such loans, to a limited amount.—The Governor accordingly obtained the sum of 106,000 dollars, which was distributed as has been stated in another part of this report.

The portage rail road across the Allegheny mountain, was included by the board, in the superintendency of the western division, and Moncure Robinson, who had been appointed the engineer in December last, was continued by the present board, for the purpose of completing his examinations and estimates upon this important public work. His report is herewith submitted. It will be seen that Mr. Robinson proposes passing the summit by a tunnel of one mile in length, and overcoming the elevation, by five lifts, and five levels on each side. The portage, according to his location, is 38 miles and 51 poles in length, and its complete execution upon his plan, is estimated at $936,004 87.

The best means of effecting this connection between the eastern and western waters, is a subject of great magnitude; for, independently of other considerations, upon it depends the successful competition of the Pennsylvania canal with other avenues, for the trade of the western states to the Atlantic. The board in employing Mr. Robinson upon this work, secured the services of an engineer of the first order. They required from him every kind of information necessary to a judicious selection of the best means of effecting the connexion. His report justifies the high opinion which was entertained of his talents and professional skill, and gives clear and comprehensive views of the subject.

At the meeting of the board in July, Major D. B. Douglas, who is known in this commonwealth as a highly respectable engineer, was appointed to make the surveys and estimates at the eastern termination of the Pennsylvania rail-road, required by a resolution of the legislature of the the 20th April last. His report and estimates upon the various routes, accompany this report. From all the facts laid before the board, they are of the opinion, that it is not the interest of the state now to construct more than one line of rail road from the inclined plane, near the farm of the late Judge Peters, and they recommend the extension of the line from that point down the western side of the river Schuilkill, to a point near Fairmount, thence across the said river and down its eastern side to sloop navigation, between Market and Chesnut streets, the road to be continued on the line and levels surveyed by Major Douglas, and projected in his report.

The canal commissioners were authorised, if they should deem it expedient, by a resolution of the legislature, adopted on the 23d of April last, to construct a road adjoining the 88th and 89th sections of the Pennsylvania canal, in Hemlock township, Columbia county; provided the cost should not exceed five hundred dollars, and provided that no part of the said sum should be expended until the citizens of the said county, should give satisfactory security for the completion of the said road, through section 87 and part of section 86.

In pursuance of this resolution, the board directed the engineer upon the North Branch division, to make an estimate of the cost of the road adjoining the 88th and 89th sections. The estimate was made, and amounted to $5,526; a proposition however was received by the acting commissioners from a contractor, for making the road for the sum of $4850. As neither came within the limits prescribed in the resolution, the board took no further order on the subject.

By the 2d section of the act of the 16th of April, 1829, relative to the appointment of canal commissioners, the board is required to appoint an engineer-in-chief of the commonwealth and superintendent of the surveys.

This important duty engaged the early attention of the board, at their first meeting. The difficulty of making a judicious selection at this period of the progress of the public works, and the dangerous consequences of making an injudicious one, are obvious. In addition to the great experience and professional skill for which this officer should be distinguished, he must have the faculty of drawing to himself powers which have been hitherto exercised by the principal engineers upon the respective divisions, without disturbing the harmony of the system; of making an innovation upon settled rules, without producing confusion.

For the purpose of obtaining the necesary information in order to proceed to a choice, the board directed the president to communicate upon the subject, with such persons as he might deem proper, and report the result of his correspondence. Two reports have

been made by the president, in pursuance of this direction, but the information received has not yet enabled the board to make a selection.

By the second section of the act of the 22d April, 1829, it is made the duty of the canal commissioners to locate the route of a suitable navigation, either by canal, or by canal and slack water, between the city of Pittsburg, or the mouth of Kiskaminetas, and the borough of Erie, within the present year. With a view to this location, the board, at their meeting in June, directed James Ferguson and Moncure Robinson, two of the principal engineers in the employment of the board, to explore and select the best summit, for a connexion of the waters of the Conneaut lake and those of lake Erie. Owing to the engagements of Mr. Robinson, upon the rail-road across the Allegheny mountain, he was afterwards excused from the performance of this duty; and the explorations were made by Mr. Ferguson, who made report to the board in October. At the same time, petitions were presented from a very respectable number of citizens, residing in the counties bordering on the waters of the Allegheny river and French creek, stating that the questions arising out of the conflicting claims of the Allegheny and French creek, and Beaver and Shenango routes, involved important interests, as well as the constitutional rights of the petitioners, should a location be made by which the waters of French creek would be diverted from their natural course. They prayed for the postponement of the location until after the next meeting of the legislature, for the purpose of having an opportunity to ascertain important facts, necessary to insure a decision in favor of the Allegheny and French creek route. The board, upon considering the subject, directed a committee to examine all the documents in relation to the subject, and to report their views of the most eligible route, at the meeting in December.

This course was deemed the best, as a decision upon the subject might still be made within the period limited by the said act of assembly. At the present meeting of the board, the committee made their report, in which a decided preference is given to the route from Pittsburg by the Beaver, Shenango, Conneaut lake, Elk and Walnut creeks, to Erie, to any other which has yet been examined. In this opinion of the committee, the board concurred; but as a location could not be made without the consent of an engineer, and the approbation of the Governor; as no engineer in the employment of the state had charge of this line, and as the board did not possess the information necessary to a precise location, by a definite line, they could proceed no further, from the information in their possession, than merely to designate the route to be preferred. The employment of an engineer, and his necessary assistants, to make such examinations as would enable the board to make a definite location, would have been attended with considerable expense, which it was thought not prudent or expedient to incur, whilst the funds appropriated by the

legislature were found to be entirely inadequate to meet the demands of other and more urgent objects. When provision shall have been made for the commencement of this improvement, the precise location of the line will occasion very little delay.

Signed by order of the board.

DAVID SCOTT, *President.*

Attest—FRANCIS R. SHUNK, *Sec'ry.*

Canal Commissioners' Office,
Harrisburg, December 18, 1829.

REPORT

OF THE

CANAL COMMISSIONERS

OF

PENNSYLVANIA,

RELATIVE TO THE

PENNSYLVANIA CANALS

AND

RAIL-ROAD.

READ IN THE HOUSE OF REPRESENTATIVES, Dec. 22, 1830.

HARRISBURG:
PRINTED BY HENRY WELSH.
1830.

REPORT

OF THE

CANAL COMMISSIONERS.

CANAL COMMISSIONERS' ROOM,
December 21, 1830.

His Excellency George Wolf,
Governor of Pennsylvania.

By order of the Board of Canal Commissioners, I have the honor of transmitting to you, their annual report and accompanying documents.

Very respectfully,
JAS. S. STEVENSON,
President of the Board of Canal Commissioners.

The Canal Commissioners of Pennsylvania respectfully submit the following Report:

That in pursuance of the notice of their being continued as the board of canal commissioners, under the act reducing the number of its members, they met at Harrisburg the first day of their official year, and immediately entered upon their duties.

The commissioners, knowing the anxiety of the legislature and citizens of the commonwealth, in relation to the deep interests involved in the state canal, and the importance of its early completion, determined to exert all the power with which they were invested to cause the canal and rail way, to the entire extent authorized by law, to be finished within the present year. They were aware that to accomplish this would require great and persevering exertions on the part of the officers and agents in the service of the state, and with the hope that the presence of the board on the respective divisions to authorize and enforce prompt

and necessary measures, would produce beneficial results, the board concluded to visit the whole line of canal and rail-way as early in the year as possible. By such visit the members of the board could acquire a personal knowledge of every part of the canal; would be enabled to compare the works planned and executed under different engineers; could decide upon the advantages or disadvantages of different arrangements and designs, and authorize the adoption of whatever they believed was most economical and beneficial. Such visit would also afford the opportunity of an acquaintance with the habits, acquirements and competency of the officers and agents on the canal, and would better enable the commissioners to decide upon the justice of claims for damages.

The immediate inspection of the works appeared the more indispensable, as no general examination had been made by any former board, doubtless from the opinion that this service did not come within the range of their duty, under the laws then existing.

The commissioners, therefore, after taking such measures, before leaving Harrisburg, as seemed necessary to insure activity on the several divisions, until reached by the board, adjourned to Johnstown, at which place they commenced their examinations of the canal, on the 5th of July, and coutinued this duty along the western division to Pittsburg.

From Pittsburg the board proceeded to the head of the Juniata division, and from thence pursued their inspection through the whole line of canal and rail way east of the mountains, giving, as they progressed, such instructions to the agents on the works as seemed most advisable. This tour of duty terminated at Harrisburg, on the 16th of September.

After remaining some time at Harrisburg, attending to the business most pressing on the board, the commissioners separated to give their attention severally on different divisions, with a view to urge the completion of the work in their charge.

The result of the operations of the season have been satisfactory to the commissioners, as they have been enabled to accomplish the leading duty assigned them. The water has been admitted into four hundred and six miles of canal; twenty miles more being the whole extent authorized, requires but the completion of a few pieces of work to be declared finished.

The forty miles of rail way bed directed to be placed under contract, has been graded, bridged and completed, ready for the reception of the rails, excepting only a small amount of work on two sections, and on two bridges.

When it is considered that the first appropriation for the Pennsylvania canal was made as late as the 25th of February, 1826, and then only to the small amount of three hundred thousand dollars; that the first contracts are dated the last of June, 1826; that the first ground was broken the 4th of July of that year, and that now within the year 1830, four hundred and twenty-six miles of canal has been finished, and a considerable part of this through a

country peculiarly difficult, it cannot but be acknowledged that though there have been many errors to regret, there has been also much effected, flattering to the power and beneficial to the interests of the state. Within the short period of four years and five months, an immense amount of labour on our public works has been done, and althongh unfortunate arrangements and excessive expenditures have, in some cases, taken place, yet great progress has been made in the mighty task the state has undertaken. Much experience has been gained and many errors may, in future, be avoided. Skillful engineers, contractors and workmen have been multiplied, and their capabilities ascertained. The necessity of employing none but faithful, intelligent and experienced engineers, the exclusion of all favoritism, and the strict enforcement of economy in the construction of our public works, has become obvious to all.

The canal and rail-way as far as authorized, being completed, the board are now enabled to make such statements as regards the principal features, general structure and actual cost of these improvements as will give the citizens of the commonwealth (at whose expense they were constructed) a better acquaintance with their great public works than it has hitherto been in the power of the commissioners to present in their annual reports. A condensed view of the leading facts relating to the state canals and of the principal works in its construction presented in a single document, accessible to all, may prove satisfactory to many who have not opportunities of general information on this subject, and may furnish some useful data for calculation and comparison,

In the plan of the Pennsylvania canal, two principal leading lines of communication have been kept in view. The great central line from Philadelphia, crossing the Susquehanna at the mouth of the Juniata, and extending westward to the Ohio river at Pittsburg, and the line diverging from this at the mouth of the Juniata, and pursuing the course of the Susquehanna to Northumberland, and from thence the courses of the West and North branches of that river, with the view of being finally extended throughout the important northern region of the state. The completion of the central line from the mouth of the Juniata to Philadelphia is evidently of equal interest to the east, west and north.

The length of the central line of rail-way and canal from Philadelphia to Pittsburg is three hundred and ninety-seven miles. The water has been introduced into two hundred and ten miles of this line, and twenty miles more are nearly ready to receive it. The central line has been arranged into the following divisions, viz:

THE RAIL-ROAD DIVISION, extending from Columbia to Philadelphia. The whole length of the division from the intersection of Vine and Broad streets, in Philadelphia, to the south end of the canal basin at Columbia, is eighty one miles and three-fourths of a mile. Fortyand a half miles of the road bed has been prepared to receive the rails. No other work has been authorized on this division.

CANAL DIVISIONS.

The EASTERN DIVISION, extends from the termination of the rail-road at Columbia, to the outlet lock on Duncan's Island, and is forty two miles and eighty-five hundredths of a mile in length.

Twenty-four miles of this division are navigable. Ten miles more nearly finished. The balance not authorized to be placed under contract.

Part of the Susquehanna division, extending from the outlet lock at Duncan's Island, to the commencement of the Juniata division, on said island. The length of this part of the canal is one mile and fifty eight hundredths of a mile. This portion of the line is navigable.

The JUNIATA DIVISION division, extending from its junction with the Susquehanna division, on Duncan's Island, to the end of section No. 184, one fourth of a mile above Huntingdon, and being eighty nine miles and five hundredths of a mile in length.

Eighty miles of this division are navigable, the remainder only requires the completion of two aqueducts.

The CANAL AND SLACK-WATER DIVISION, proposed to extend from the end of the canal at Huntingdon, to the head of the canal basin, near Hollidaysburg, as designed by Moncure Robinson. The length of this division will be thirty nine miles.

No part of this division has been authorized to be placed under contract.

RAIL WAY OR MACADAMIZED TURNPIKE, extending from the head of the basin, near Hollidaysburg, located by Moncure Robinson, and following the route and plan proposed by him, to the head of the basin, at Johnstown, the distance is thirty-seven miles ninety-three hundredths of a mile.

Various surveys have been made, and different routes and plans have been proposed for this portage, but no part of the line has been authorized to be placed under contract. The lowest depression of the Allegheny mountain, within the range of the portage, is at Sugar Run Gap, and this is one thousand three hundred and sixty four feet seven inches above top water in the basin, at Hollidaysburg; one thousand one hundred and forty-one feet above the top water line of the basin at Johnstown, and one hundred feet above the bottom of the tunnel, proposed by Moncure Robinson, in his report of last year.

The WESTERN DIVISION of the Pennsylvania canal, extending from the head of the basin at Johnstown, to the out-let lock, into the Monongahela river at Pittsburg. The whole length of this division is one hundred and four miles and thirty three hundredths of a mile.

This division of the canal, is navigable throughout its whole course, as is also a branch of three fourths of a mile in length, which leads into the Allegheny river, at the town of Allegheny.

The divisions leading northward, from the Juniata, at Duncan's island, and their several lengths are as follows:

The SUSQUEHANNA DIVISION, extending from the out l lock into the Susquehanna, at Duncan's island, to the south end the towing path bridge at Northumberland. The length of this division is thirty-nine miles. This division is in navigable order.

The WEST BRANCH DIVISION, extending from the sout end of the towing path bridge, at Northumberland, to the end c the towing path, one mile and one fourth above the feeder dam, a Muncy ripples. This division, is twenty four miles and a half i length, and is in navigable order.

The NORTH BRANCH DIVISION, extends from its point of intersection with the west branch, in the basin, in the town of Northumberland, to the feeder dam at Nanticoke falls, and is fifty-five miles and a half in length.

The water has been admitted into this division, but it is not yet entirely navigable. The slackwater, extends five miles above the Nanticoke dam, and within two miles and a half of Wilkesbarre.

The other divisions of canal are,

The DELAWARE DIVISION. This extends from the tide basin at Bristol, to the north side of the feeder dam at Easton. Its length is fifty-nine miles and three fourths. The water has been admitted into this division, but only twenty-five miles are yet navigable. Part of the work first constructed, has proved defective, and requires extensive repairs.

The FRENCH CREEK FEEDER, extends from near Bemus' mill, on French creek, to its termination at Muddy run. Its length is nineteen miles and a half. The water has been admitted into this line from some small streams.

Although the canal and rail way has been arranged into divisions, and these into lines, and though no connection is meditated between some of the divisions, yet appropriations have been made under the general name of the Pennsylvania canal and rail way Accounts have, however, been kept, with reference to divisions and lines.

From these accounts, it appears that the whole amount of moneys appropriated for the Pennsylvania canal and rail road, and placed at the disposal of the canal commisssioners, up to the 10th of December, 1830, has been ten millions two hundred and eighty eight thousand three hundred and nine dollars and fifty-nine cents.

The whole amount drawn from the treasurer, after deducting all sums repaid, has been ten millions two hundred and eighty-three thousand seven hundred and sixty eight dollars and eighty-nine cents.

These sums have been drawn under the following heads:

WESTERN DIVISION.

By superintendents of construction,	$2,567,496 94	
By supervisors,	41,600 00	
		$2,609,096 94

JUNIATA DIVISION.		
By superintendents, &c.	$2,240,301 16	
Supervisors,	16,689 47	
		$2,256,990 63
DELAWARE DIVISION.		
By superintendents, &c.	1,168,385 61	
Supervisors,	10,000 00	
		1,178,385 61
EASTERN DIVISION.		
By superintendents, &c.	1,202,830 11	
Supervisors,	11,233 64	
		1,214,063 75
NORTH BRANCH DIVISION.		
By superintendents, &c.	1,002,483 03	
Supervisors,	5,000 00	
		1,007 483 03
WEST BRANCH DIVISION.		
By superintendents, &c.	349,004,87½	
Supervisors,	5,600 00	
		354,604 87½
FRENCH CREEK FEEDER.		
By superintendents, &c.	287,103 72	
Supervisors,	5,00000	
		292,103 72
RAIL-ROAD.		
By superintendents, &c.		287,584 56½
SUSQUEHANNA DIVISION.		
By superintendents, &c.	1,039,256 77	
Supervisors,	9,200 00	
		1,048,456 77
Board of canal commissioners,		29,000 00
Board of appraisers,		54 00
Board of internal improvement,		5,990 00
Balance in the treasury,		4,540 70
		$10,288,309 59

Of the amount thus drawn, settlements have been made at the treasury, of upwards of ten millions one hundred and fifty thousand dollars, and the accounts shewing the application of the balance, are in a train of adjustment.

It will be perceived that to form the necessary connections between the parts of the canal already finished, so as to fulfil the original design, and render the canal productive, will require the completion of the rail-way between Philadelphia and Columbia; the completion of nine miles of canal between Middletown and Marietta; of thirty-nine miles of canal and slack-water navigation;

and of thirty-eight miles of portage road, between the canal at Huntingdon, and the canal at Johnstown. These works may be justly viewed as necessary and profitable connexions, and not as extensions. The Board have therefore deemed it proper to embrace them in this statement, in relation to the general work.

As a brief view of the several divisions of the canal and rail-way, and of the necessary connecting works, may be satisfactory, the following remarks are made.

The Philadelphia and Columbia Division of the Pennsylvania rail-road, commences at Philadelphia, and runs westward, through the counties of Philadelphia, Montgomery, Delaware, Chester and Lancaster to Columbia, and there connects with the great central line of canal and portage, leading to Pittsburg, on the Ohio river; from which point an extensive steam boat navigation opens through the vast and productive regions, pervaded by the waters of the Mississippi and its tributary rivers.

The line of location from Philadelphia to the foot of the Schuylkill inclined plane, has not yet been determined. Two principal routes have been specially urged. The one commences at the intersection of Vine and Broad streets, passes along the bed of the abandoned canal, and crosses the Schuylkill, to the foot of the plane, at Peters' farm. The other crosses the Schuylkill at Fairmount, and passes up the western side of that river, to the said plane.

It must be admitted that the weight of public opinion at Philadelphia, favours the first named location. That the line is somewhat shorter, and that by adopting the course and level of the canal bed, the work can be effected at less cost than on the Fairmount route. It is urged, however, by the advocates of the Fairmount route, that the difference of distance and cost will be inconsiderable, and that a large interest west of the Schuylkill, will be respected by running the rail-way to the head of tide, in the Schuylkill, before crossing that stream.

The advocates of each plan, will doubtless submit their views for legislative decision.

The whole line of the Pennsylvania rail-road, from the intersection of Vine and Broad streets, pursuing the old canal line, and crossing at Peters' farm, (which route is assumed with a view to a definite statement of length and cost) to the end of the canal basin, at Columbia, is eighty-one miles and three fourths, only five miles longer than the travelled turnpike road. From Vine and Broad streets, to the foot of the Schuylkill inclined plane, the distance is two miles and two thirds. The foot of the plane is forty-seven feet nine inches above mean high tide, and the rail-way runs nearly on that level, from Philadelphia to the plane.

The Schuylkill plane is two thousand seven hundred and fourteen feet long, and its elevation from foot to head, is one hundred and eighty-five feet. From the foot of this plane, the rail way bed has been completed for a distance of twenty miles and one quarter. The succeeding thirty-six miles and a half have been located, but

have not been placed under contract. The next twenty miles and one third, of the road way, has been finished, reaching to the head of the plane at Columbia. From this point to the canal basin (a distance of one mile and one fourth,) the road way has not been placed under contract. The plane at Columbia, is one thousand nine hundred and fourteen feet in length, and has an elevation from foot to head, of ninety feet. The surface line, in the canal basin at Columbia, is two hundred and thirty-seven feet and twenty seven hundredths above mean high tide, in the Schuylkill, at Fairmount. The top water line in the basin, at Columbia, is nineteen feet four inches above low water mark, in the Susquehanna, at the abutment of the bridge over that river. At the head of the inclined plane, at the Schuylkill, it is intended to station a steam engine of from forty to fifty horse power; and one of the same force at the head of the plane at Columbia. The engine at Columbia, will be of sufficient strength to elevate eight hundred tons from the foot to head of the plane, in the day of eleven hours.

As the amount of tonnage going eastward, will greatly exceed that going west, the engine at the Schuylkill, though acting on a longer plane, and one of greater elevation than that at Columbia, will still be able to forward the tonnage to any extent that can be offered.

The line of location of this rail way, seems unparalleled for its facilities and advantages.

The highest point on the line, is at the Gap of Mine Ridge, thirty miles from the basin, at Columbia. By a cut of thirty-one feet and one fourth, for a short distance, this is reduced to five hundred and sixty feet above mean high tide to three hundred twenty-seven feet and one fourth above the head of the plane, at the Schuylkill, and to two hundred and thirty-three feet above that at Columbia.

Although the cutting on the location, is generally light, except at the Gap mentioned, yet the elevation will not, on any part of the distance between the head of the plane at the Schuylkill and the head of the plane at Columbia, a space of seventy-seven miles, exceed thirty feet to the mile, in either direction, being less than one third of a degree.

Even on the Liverpool and Manchester rail way, though but thirty-two miles in length, and recently constructed in the most costly and admirable style, under the patronage of the commercial and manufacturing wealth and power of England, upwards of one and a half miles of the road, has unavoidably a graduation of fifty-five feet in the mile. It is found however, in practise on this road, that locomotive engines, which draw forward twenty tons, at the rate of nineteen miles per hour, on a level, can proceed at the rate of seven miles per hour, at this elevation of fifty-five feet to the mile. There can be no doubt, but that a locomotive engine of sixteen horse power, weighing five tons, will draw thirty tons, and twelve waggons, at the rate of six miles per hour, up an elevation, not exceeding a grade of thirty feet per mile, without fear of this

weight causing the engine wheels to slide on the plane, or to have only a rotary motion (of the wheels) without a progressive motion along the plane.

In practice, it will be found, that a locomotive engine, with thirty tons of coal or other loading attached, will be able to travel the whole distance, from Columbia to Philadelphia, in a day of ten hours. The rise in the direction of the greatest trade, viz: from the head of the plane at Columbia, to the summit of Mine Gap Ridge, is but two hundred and thirty-three feet; the rest of the distance is nearly level, or descending. A good Pennsylvania wagon horse, will, on this rail way, convey ten tons a distance of twenty-seven miles per day, with ease.

The country through which the Columbia and Philadelphia railway runs, is the most highly cultivated, populous and wealthy part of the state. Through it for many years a large amount of produce floated down the Susquehanna to Columbia, has found its way to Philadelphia.

So considerable has been the travel and transportation on this road from Columbia to Philadelphia, that thirty-five years ago, the inhabitants of Lancaster and Chester counties, with a view to a more easy transportation, undertook the then Herculean labor of making a turnpike road from Lancaster to Philadelphia; by their steady perseverance and solid wealth, they accomplished this heavy task, and made the public their debtors for the example of the first turnpike constructed in the Union.

The spirit of improvement still visits these favored counties and notwithstanding some opposition, will lead their inhabitants to encourage and adopt amongst them one of the most useful and splendid attainments of the present day. The county of Lancaster gave to the WORLD the citizen who first taught the power of steam so beneficially to propel "the vast barge." Its inhabitants will sustain an improvement, along which the same power may as beneficially "whirl the rapid car."

The utility of rail-ways and the advantages of the locomotive engine are no longer matters of experiment or doubt with those who have seen their operations. But as few of our citizens have had such opportunities, it is of general advantage that the first railway commenced by the state is located so immediately in the line of travel in Pennsylvania, that thousands of our citizens from various parts of the commonwealth, upon its completion, must unavoidably witness such demonstrations as will satisfy every beholder. The citizens between Columbia and Philadelphia are not alone interested in the completion of this rail-way; as evidences of the advantages of structure will there be established of high interest to every part of the state, not accessible by canals; and when proved to be useful, then by public or private funds, rail ways can be extended in every beneficial or profitable direction, and thus other portions of the state than those now embraced within the range of improvement may equally share the public favor.

The benefits of a rail-way from Columbia to Philadelphia must

be especially felt by the inhabitants, not only by cheapening transportation from their homes, but for a wide extent on each side of the rail-way, by furnishing coal, timber, boards, &c. from distant places, at a cheap rate, to settlements where the agricultural products of each acre are too valuable to admit of being reserved as woodland. The completion of the canal to the exhaustless beds of prime coal in the Wyoming Valley, will insure supplies to any extent; and within one year after the rail-way is finished, coal will be sold at less than three dollars and fifty cents per ton throughout the whole of its course. By means of the rail-way, Lancaster and Chester counties will also have the benefit of being embraced in the great line of communication for the trade between Philadelphia and Pittsburg; between the commercial metropolis of the state and the mart for the reception and distribution of the trade of the extensive west, a trade which even now keeps eight hundred wagons in steady employ.

The business on this road, when the whole communication is arranged with the navigable western waters and with the productive northern regions of our own state, will, within the first year, astonish the most sanguine.

The original cost for grading, bridging and preparing the bed of the rail-way from Columbia to Philadelphia, made in 1828, was four hundred and sixty-two thousand four hundred and forty one dollars and seventy-seven cents.

The following statement shews the principal works on forty miles and a half of the road bed and their actual cost. The road-way is twenty-two feet wide, and has been arranged with a view to a double track.

Cost of excavating, embanking, &c. forty miles and a half,	$164,441 10
10 road and farm bridges, across the rail way, Stone abutments, superstructure of wood, span from thirty-one to fifty-four feet.	13,217 53
12 bridges—forming five hundred and ten feet of the line of the rail-way, principally stone arches,	9,401 28½
5 bridges—forming three thousand five hundred and seventy-eight feet of the line of the rail-way,	63,735 29
25 stone culverts—whole span, one hundred and twenty-eight feet,	8,406 49
70 miles of fencing,	32,592 71
For repairing and protecting embankments,	3,528 64
Incidental expenses,	1,272 55½
Engineer, superintendents, &c.	21,509 00
Additional amount required to pay engineers, superintendents, and contingent expenses,	2,000 00
Amount paid as damages,	525 29
	$320,629 89

From this amount should be deducted $38,874 75, being the value of 57,000 cubic yards of stone, obtained in the excavation of the sections, and which will be of that value in the construction of the rail-way. Its excavation cost $31,536 36, at the contract prices.

The following statement will shew the additional cost for completing the work.

For grading, bridges, &c. including superintendence and all charges, forty-one miles and one fourth of rail-way bed, in addition to what has been done,	$320,000 00
For laying a single track-way, on eighty-one miles and three fourths, on the best plan, and in the best manner, at $5,500 per mile,	449,625 00
2 steam engines, of forty-five horse power, each, with buildings, ropes, &c.	15,000 00
	$784,625 00
If a double tract be laid, add	449,625 00
	$1,234,250 00

The grading, bridging and forming the rail-way bed throughout the whole line, from Columbia to Philadelphia, can be completed in the year 1831, and forty miles of the rail-way can be laid for use by the 1st of June, 1832; the remainder by December, of the same year.

The mechanical and other work on this division, appear to be executed in the best style.

The largest bridge on the line of the rail-way, is that over the Conestogo, near Lancaster. It is built on Town's lattice plan, is fourteen hundred feet long, has twenty-two feet width of platform. Its abutments and piers are composed of excellent rubble masonry laid in mortar. There are ten piers; the highest of these is sixty feet. In the piers and abutments, there are eight thousand three hundred and twelve perches of masonry. The materials in the superstructure are all prime, and the work does credit to the contractors. The bridge is of great strength, it is roofed and weather boarded. The whole cost of this work was only thirty-one thousand, six hundred and fifty-two dollars.

An arch bridge has been built over Little Conestogo, on Burr's plan. This work has been faithfully constructed and is a beautiful specimen of bridge architecture. The bridge is eight hundred and four feet long, contains three thousand, three hundred and twenty-six perches of masonry, is roofed and weather boarded, yet the cost when completed, was but fifteen thousand three hundred and fifty-nine dollars. The highest pier in this bridge is forty-seven feet. There are five piers.

The eastern division of the Pennsylvania canal, commences at the point of connexion of the Pennsylvania rail-way, with the canal basin at Columbia, and runs through the counties of Lancaster and Dauphin, along the eastern side of the Susquehanna river, to a point opposite Duncan's island; then crosses the Susquehanna by a towing path bridge, and terminates at the outlet lock of the Susquehanna division, at Duncan's island. The whole length of this division, by the towing path, from the foot of the basin at Columbia, to the outlet lock at the island, is forty-two miles and eighty-five hundredths of a mile.

About thirty five miles of the division passes through a country highly favourable for the construction of a canal. The river bottoms are wide, and admit of the adoption of any level desired. The excavation in general is easy, and the materials for banks good. About eight miles may be termed difficult, and part of it, judging by the expense, extremely so. Th ee hundred and fifty-one thousand dollars, were expended in constructing about three miles and a half of the prism of the canal, exclusive of mechanical and other work.

The width of the canal on this division is twenty-eighty feet at bottom—forty feet at top water line—the depth four feet.

The top water line of the basin, in which the Pennsylvania and Union canals unite, at Middletown, is fifty-two feet and a half above that of the basin at Columbia, and two hundred and ninety feet above tide. The top water of the large basin at Harrisburg is three hundred and twelve feet, and the surface line of the pool around Duncan's Island, three hundred and thirty-two feet, respectively, above tide. The floor of the vestibule of the state capitol is three hundred and sixty feet above tide.

The twenty-four miles of this division, lying between the Swatara and Duncan's Island, was the first line of state canal placed under contract, and has been for some time in navigable use.

On these twenty-four miles there are six lift locks on the main line. One lock of three feet, leading from the main line to the basin at Middletown, and two locks leading from said basin into the Swatara river, having each nine feet lift.

The original estimated cost of these twenty-four miles, made in 1826, was four hundred and five thousand five hundred and eleven dollars. The first contracts are dated in June, 1826. The ground was broken July 4th, 1826.

It is now ascertained that the whole cost of these twenty-four miles, inclusive of damages, has been eight hundred and thirty-two thousand and thirty-six dollars and sixteen cents.

The following statement exhibits the principal works, and their cost.

Cost of constructing the sections.		
Excavation and embankment, &c. including a basin at Middletown,	$273,968 24	
196,019 perches of vertical wall,	133,674 38	
		407,642 62

4½ miles of turnpike road on the whole division,	22,000 00
11 locks cost,	132,721 91

These locks are constructed of cut stone, and are seventeen feet in width and ninety feet in length, clear, in the chambers.

A feeder dam across the Susquehanna, at Duncan's Island.

The old dam consisted of a line of loose stone, extending across the stream, which, together with the sluice, and including six thousand and eighty-seven dollars and one cent and a half, paid in repairing, cost,	29,799 16
The new dam is one thousand nine hundred and ninety-eight feet long, between the sluice wall and the abutment on Duncan's Island. The dam is eight feet and a half high, from the bed of the river. It has a base of thirty feet, and is composed of strong timbers, cribbed together and filled with thirteen thousand perches of stone, well packed, and covered with large timbers, thirty-five feet long. The upper end of the timbers are covered with stone four feet above the foundation. This work cost,	18,421 60
The stone of the old dam were used for filling and covering.	
The western abutment contains six hundred and ninety-eight perches of masonry, laid in mortar, and together with its guard bank, cost,	2,750 50
This dam was completed for use in eighty-five days from the day of contract.	
4 aqueducts—the longest one hundred and twelve feet, the shortest eighty-one feet; the whole length between the abutments is three hundred and seventy-three feet, width from eighteen to twenty feet,	43,724 09
The piers and abutments of cut stone and rubble masonry, the superstructure partly stone and partly wood.	
12 culverts, stone, whole span sixty eight feet,	14,641 51
6 waste wiers, whole overfall two hundred and fifty-one feet,	2,716 37
5 water ways,	1,250 00
7 lock houses,	2,997 69
13 road and 34 farm bridges, stone abutments, superstructure wood,	41,915 03
1 basin at Harrisburg, of three acres and a half	3,699 35
The fencing cost about	14,000 00
Incidental expenses of the whole division,	2,193 19
Engineers, superintendents, &c. of the whole division,	33,193 19

Repairs to the 10th of June 1830,	27,212 44
Miscellaneous, on the whole division,	18,731 97½
Damages paid on the whole division,	12,425 54
	$832,036 16½

Of the remaining eighteen miles and seven-eighths of this division, ten miles were authorized to be placed under contract, and the most difficult parts were selected. The original estimated cost of the ten miles placed under contract, made in 1828, was two hundred and forty thousand eight hundred and fifty-five dollars. These ten miles are nearly completed.

The works and cost, when finished, will be as follows:

Sections—Excavation and embankment	$ 185,068 97	
One hundred thirty-eight thousand four hundred and eighty-six perches of vertical wall,	135,989 63	
Forty four thousand nine hundred and fifty-eight perches of rip rap wall, for foundation, and five thousand one hundred and ninety yards of inside wall,	22,619 15	
		$ 343,677 75
6 lift locks,		30,812 00
3 aqueducts—whole length two hundred and seventy feet, width, from twenty to twenty-eight feet,		7,991 40
4 culverts of stone—whole span twenty-eight feet,		2,136 75
2 waste wiers—whole overfall one hundred feet,		700 00
6 water ways,		4,200 00
6 lock houses,		1,800 00
Bridges—three road and five farm,		5,458 49
1 basin at Columbia, say		3,000 00
1 culvert at Haldeman's mill,		1,200 00
Fencing, about		2,277 23
Add for expenses,		2,211 74
Amount of work not yet included in final reports,		46,232 04
		451,697 30
Cost of twenty-four miles above Middletown,		832,036 16
		$ 1,283,733 46

The eight miles and seven eighths, not under contract, will require the following works, viz:

Sections—Excavation, embankment, &c.	$ 54,000 00
Aqueduct over the Swatara, two hundred and fifty feet from abutment to abutment, Stone abutments and piers, and superstructure of wood.	25,000 00

2 locks of eight feet lift each; 2 lock houses,	13,100 00
4 culverts, whole span twenty four feet,	1,300 00
3 waste wiers and 2 water ways,	1,550 00
19 bridges,	8,560 00
12 miles of fencing, at three hundred and sixty dollars per mile,	4,320 00
Engineers, superintendents, &c.	8,000 000
Add contingencies,	5,000 00
	$ 116,170 00

The whole work is remarkably easy of construction, and if authorized by the 1st of March, can be finished for use by the first of September next, at an expense, including superintendence, and all other changes, not exceeding one hundred and sixteen thousand dollars. Fifteen lock keepers required on the whole division.

THE SCHUYLKILL CANAL

Belongs to an incorporated company. It commences at Fairmount, near Philadelphia, and runs to Port Carbon, in Schuylkill county.

The distance from tide to the point at which the Union canal commences is sixty miles. The rise or lockage to the said point is one hundred and eighty-two feet and one fourth, from mean high tide in the Schuylkill. On this part of the canal there are thirty-four lift, guard and outlet locks. This canal leads to the coal beds in Schuylkill county. It is one hundred and ten miles in length, was the first canal carried into successful operation in the state, and does credit to the enterprize and public spirit of the stockholders. It has cost about two millions of dollars.

THE UNION CANAL

Is the property of an incorporated company. It commences in the Schuylkill canal near Flying Hill Run, extends to Middletown, and connects with the Pennsylvania canal in a basin at that place. The whole lengh of this canal is eighty miles. The rise or lockage from the point of separation from the Schuylkill canal to the summit level is three hundred feet. The fall to the topwater in the basin at Middletown is one hundred and ninety-two feet and an half. On this canal there are ninety-two lift and two guard locks.

Through these canals and the Pennsylvania canal a communication is now established from Philadelphia to Wilkesbarre, and also to Huntingdon.

A very considerable increase of business will shortly take place on these canals, in consequence of the completion of a material part of the Pennsylvania canal, with which these connect.

The great expenditures which the Schuylkill and Union canal companies have made has effected much for the benefit of the public, and in all reasonable matters they are entitled to public protection and favorable consideration.

These canals are here brought into view from their close connection with the eastern division of the Pennsylvania canal; and

from the fact of their forming a part of an entire line of communication from Philadelphia to Huntingdon, and from Philadelphia with the canal along the Susquehanna and its branches.

JUNIATA DIVISION.

From the outlet lock at the end of the eastern division, to the point on Duncan's island at which the Juniata division commences, the distance is one mile and fifty-eight hundredths of a mile. The rise from the surface line of the pool in the Susquehanna at the outlet to the topwater line at the commencement of the Juniata division, is twenty feet nine inches. This portion of the canal forms part of the Susquehanna division.

The Juniata division commences on Duncan's island in the county of Dauphin, and runs through the counties of Perry, Mifflin and Huntingdon, to a point one fourth of a mile above the town of Huntingdon. The whole length of the division, by the towing path, is eighty-nine miles. The topwater line at the connexion of the Juniata and Susquehanna divisions, on Duncan's island, is three hundred fifty-two feet and a half above mean high tide at Philadelphia.

Compared with other divisions, a considerable part of this may be classed as difficult. The entire course of the Juniata river lies through a mountainous country. The mountains are of great elevation, their sides steep and rocky; in some cases extending for many miles parallel with the stream; in others their general range intersects the stream, leaving merely a gap for its passage. The margin betwixt the mountains and river is in many places extremely contracted. The banks of the Juniata are generally bold, and are as well calculated for a slack water navigation as any river of the state.

About fifty-four miles of the division, may be considered as offering the ordinary facilities, twenty miles as difficult, and fifteen miles as very difficult.

The width of the canal, on the Juniata, is twenty-eight feet at bottom, forty feet at top water line, and it has four feet of depth. In its course there are thirty-five lift locks, three guard locks, one out-let and four river locks. The lift locks are fifteen feet by ninety feet clear in the chambers. The lockage or rise from canal top water, at the point of separation of the Juniata and Susquehanna divisions, to the top water of the level above Huntingdon, is two hundred and fifty-one feet and a half. The top water of the canal at Huntingdon, is six hundred four feet and three inches above tide.

The original estimates for constructing this division, were seventeen hundred and forty-one thousand five hundred and eight dollars. The first contracts were made in August, 1827.

It is now ascertained that the actual cost of the division, including thirteen thousand five hundred and sixty-four dollars, paid as damages to property, will be two millions four hundred and ninety thousand two hundred and ninety dollars.

The following is an exhibit of the principal works and their cost:

Cost of constructing the sections, excavation, embankment, &c., from Duncan's island to Lewistown,	$686,928 40½	
From Lewistown to Huntingdon,	846,708 54½	
		1,533,636 95
1 out-let lock at Lewistown, constructed of wood,		7,542 79
1 guard lock at North's island, of wood,		3,985 00
1 guard lock at Raystown,		8,230 14½
1 guard lock at Aughwick falls,		13,157 14
35 lift locks—Of these, three are constructed of cut stone, five of rubble masonry, one combined with a stone aqueduct, and twenty-six constructed of rubble masonry, laid in mortar, on timber bottom with longitudinal sills and upright posts, faced with plank spiked to the timbers,		203,246 78
4 dams—The whole length between their abutments is about two thousand two hundred and fifty feet, height from eight to nine feet. Their cost, including four river locks, and one schute and sluices,		90,870 91
Pier heads,		7,804 14
19 aqueducts—Their whole length is twenty-eight hundred and ninety-seven feet; the longest six hundred feet, the shortest twenty-six feet, width generally eighteen feet, stone abutments and piers, superstructure of wood,		245,351 04
One of these aqueducts built over Buffaloe creek, is formed of cast iron, covered with iron plates and floored with cut stone, laid in cement.		
25 waste wiers,		13,453 34
60 culverts—Whole span, three hundred and forty-six feet, rubble masonry in mortar,		61,799 16½
89 road, 63 farm, and 5 towing path bridges, exclusive of embankment,		40,436 53
Roads—Seven miles and a half of turnpike, and fourteen miles and three fourths of township roads,		60,745 18½
Fences—At eighty cents per panel of ten feet,		21,397 71
29 lock houses,		20,371 64
Castings,		3,879 58
Rope ferry,		8,086 79½
Repairs,		69,355 18½
Contingent expenses—Target, levels, rent, &c.		3,880 60½
Engineering,		51,388 25
Superintendents, &c.		8,107 00
Damages paid,		13,564 31½
		$2,490,290 13½

30 lock keepers required.

That part of the division above Lewistown, into which the water has been recently admitted, proves to be excellent canal.

The proposed canal and slack water, along the Juniata, above Huntingdon, may extend from the head of the canal at that town, to the head of the basin at Hollidaysburg, as arranged by Moncure Robinson. The whole length of the division, will be thirty-nine miles; all within the county of Huntingdon.

A considerable part of the country through which this division must pass, partakes of the mountainous character of the lower Juniata. The river bottoms are contracted, the banks are high, bold and rocky; the stream narrow, its fall averages eight feet per mile.

It is obvious from this general character, that a great saving may be made by converting the most difficult parts of the line into a slack water navigation of the river bed, by means of high dams. These may be so arranged as to save many miles of canal, along the most difficult parts of the shore, and this will greatly diminish the general cost.

Should a canal be constructed only along parts of the division, where the ground is favorable, it is clear, that the proportion of excavation, embankment, &c. will be much less than if a canal were extended through the whole line.

The dams may be so arranged, that no acqueducts will be required. A large saving will also be made by the diminished number of bridges, culverts, waste wiers, as also in the quantity of wall, fence, road, &c It is obvious too, that the whole work can be completed in much less time than by constructing a canal through the whole line. Objections cannot be fairly made to the erection of these dams, as the river bed above Huntingdon, is but little used for navigation.

The communication by canal and slack water between Huntingdon and Hollidaysburg, can be completed by the 1st of May, 1832; provided the legislature authorize the work as early as the 1st of March, 1831.

The cost of the proposed slack water and canal communication, may be fairly estimated at $546,000.

The whole rise and lockage from top water of the canal levels, at Huntingdon, to top water of the basin, at Hollidaysburg, is three hundred and twenty-three feet nine inches. The water surface of the basin, proposed at Hollidaysburg, is nine hundred and twenty-eight feet above mean high tide.

Having through the Schuylkill, Union and Pennsylvania canal, or by the Pennsylvania rail-way and canal reached Huntingdon, and passed along the course by which a water communication can be advantageously extended to Hollidaysburg, the Allegheny now presents its formidable outline.

Destined to separate the great waters of the east and west, this mountain bids defiance to all the efforts of art to connect the water navigation which has been so successfully arranged to its eas-

tern and western base. Man it seems may disturb and modify the mere incidental arrangements of nature;—her mighty laws and works must still prevail. We are therefore, here forced to find some other means, by which to cross this great barrier, than that of a water communication.

Standing on the level of the water line of the basin at Hollidaysburg, nine hundred and twenty-eight feet above mean high tide, and two hundred and twenty-three feet below the level of the canal basin at Johnstown, on the opposite side of the Allegheny mountain, and looking in the direction of the head of the basin, at that place, a direct line strikes the comb of the mountain at Blair's Run Gap summit, three miles south of the present turnpike road. This summit is one thousand six hundred and sixty-nine feet above the level of the basin at Hollidaysburg. On the left of this summit are Bob's Creek Gap, one thousand five hundred and seventy-eight feet high; and farther to the left Cedar Swamp summit, one thousand five hundred and thirty-two feet high. On the right Laurel run summit, one thousand five hundred and eighty-seven feet. Adams' Run, one thousand five hundred and forty-nine feet. Blairs' Gap, one thousand four hundred and fourteen feet. Sugar Run, one thousand three hundred and sixty-five feet, respectively, above the basin at Hollidaysburg. The last mentioned summit is about one mile and a half north of the turnpike. The tunnel proposed by Moncure Robinson, is one mile north of the turnpike, one mile in length, and one thousand two hundred and sixty-four feet, and sixty hundredths of a foot above the basin at Hollidaysburg, and the comb of the mountain immediately over the tunnel, is one thousand four hundred and forty one feet and sixty hundredths above said basin.

It appears, that, to pass the lowest depression of the mountain, within the range of the portage, one thousand three hundred and sixty-five feet of elevation must be overcome, on the eastern side, in about ten miles and a half to the crest; and that the descent from that point to the canal basin at Johnstown, is one thousand one hundred and forty-two feet. The distance, about twenty-seven miles and a half.

To expedite and cheapen transportation across this portage, many plans have been proposed, and many surveys and examinations have been made. Time, discussion and reflection, have narrowed down these plans, until two only are admitted to be worthy of consideration; the one by means of a Macadamized turnpike; the other by a rail-way. It is satisfactory to know, that the mountain readily admits of the adoption of either plan.

Should a rail-way be deemed the most advisable, on account of the great expedition and cheaper rates at which transportation can be effected, the most eligible plan would seem to be that arranged with spaces of the road graded below one third of a degree, extending as far as conveniently practicable, and terminating with an inclined plane of about half a mile in length, rising at a grade not exceeding five degrees. A steam engine, of forty horse power,

to be stationed at the head of such plane, to draw up the loading, brought to its foot by horse or other power, and thus alternately until the whole elevation of the mountain is overcome. In this manner, nine or ten steam engines and a small number of horses, could pass five hundred tons from basin to basin, in each direction, in a day of eleven hours, at a very moderate expense.

The extensive demand for fuel, in the city of New York, and its high price, induced a number of enterprizing citizens to attempt to arrange an advantageous communication, by which to transport coal from Carbondale, in Pennsylvania, to that populous city. After much labour and expense, success attended the enterprize.

This line of communication is by the Hudson river to Kingston, ninety miles; thence by a canal through the state of New York, to Honesdale, in Pennsylvania, one hundred and four miles; and from this point by a rail-way of sixteen miles, to the coal mines on the Lackawannock, in Luzerne county. The whole distance from New York city to Carbondale, is two hundred and ten miles.

In passing from the coal mines, at Carbondale, to the top of the mountain between that place and the head of the canal, it is necessary to overcome an elevation of eight hundred and fifty-five feet in four miles, and to descend nine hundred and thirteen feet to Honesdale. The greater part of this elevation, is overcome by five stationary engines, each acting at the head of an inclined plane, of about half a mile in length, and having an elevation of about one hundred and eighty-five feet to the half mile.

To satisfy themselves, as to the actual practical results of stationary steam power, acting on inclined planes, the members of the board, in the course of their travel, visited the rail-way at Carbondale, so that by their own personal inspection, they might know how far the proposed application of stationary steam power, connected with a system of inclined planes and levels, might be beneficially applied to overcome the great elevation of the Alleghany mountain, between the heads of the Pennsylvania canal.

The board wished also, to be enabled to judge of the practical results which might be expected, on the Susquehanna and Schuylkill planes, of the Columbia and Philadelphia rail-way.

At the time the commissioners visited the Carbondale rail-way, the mining operations of the coal company did not enable them to present for transportation, more than two hundred and fifty tons per day. This quantity, was daily conveyed across the mountain. The operations of the stationary engines, were carefully noted, and in the ordinary routine of business, it was observed, that seven tons and a half of coal contained in three cars, the whole weighing ten tons, was conveyed from foot to head of each plane, at an average of eight minutes, and that only eleven minutes elapsed from the time the machinery was attached to one train of cars, to the time these were passed on, and another train was attached. Consequently, the machinery was capable, by steady operation, (and machinery never tires) to pass, in the day of twelve

hours near five hundred tons of coal. The engines are thirty-five horse power, and the whole cost to the company, for each engine, including attendance, fuel, and all charges, is six dollars and forty-two cents per day.

The company by contract, and at a profit, convey merchandize across the sixteen miles for thirty-five cents per ton, exclusive of toll.

The whole elevation and descent, to be overcome on the Moosic mountain, between Carbondale and Honesdale, is one thousand seven hundred and sixty-eight feet, in a distance of sixteen miles. That from the basin at Hollidaysburg to Johnstown, taking the lowest depression of the mountain, is two thousand five hundred and seven feet in a distance of thirty-eight miles. The elevation of the Moosic mountain, is therefore, nearly equal to three fourths of that of the Allegheny, yet, the first named mountain is overcome, through the means and arrangements of merely an incorporated company; surely, then the most wealthy and powerful state of the Union, is competent to establish and maintain the arrangements necessary to overcome the difficulty on the Allegheny.

Should the legislature determine to adopt the plan of a rail-way across the Allegheny, dispensing with the tunnel, the cost may be fairly stated as follows:

For grading, bridging and finishing the rail-way bed, for a double track-way, including all expenses, say thirty-eight miles, at $9 000 permile,	$342,000 00
For a single track-way, at $5,500 per mile, laid in the best manner, and including all expenses,	201,400 00
Steam engines, ropes, buildings, &c.	60,000 00
	603,400 00
If an addditional track be laid after the first is completed, it will cost $5,000 per mile,	190,000 00
	$793,400 00

Should it be determined to adopt a Macadamized turnpike, for the present, the road may be graded as has been herein proposed, and teams can be doubled on the planes, and a rail way can, at a subsequent period, be laid upon the bed of this road.

The report of Moncure Robinson in 1829, and of the engineers appointed under the act of 27th March last, is referred to for further information upon the subject of the portage.

The western division of the Pennsylvania canal will unite with the proposed portage, across the Allegheny mountain, at an extensive basin arranged at Johnstown, in the county of Cambria, with a view to such connexion. The head of the division is at the basin mentioned, from whence the canal runs through the counties of Cambria, Indiana, Westmoreland, Armstrong, Butler and Allegheny, and terminates in the Monongahela river at Pittsburg.

A branch terminates in the Allegheny river, at the town of Allegheny.

A very considerable part of this division presents difficulties in the construction of a canal, especially between Johnstown and Blairsville. The sides of the gaps through the Laurel Mountain and Chesnut Ridge are rocky, precipitous and of great elevation; a passage is barely afforded to the stream. The river hills through the whole extent of the canal are high, steep and liable to slip.

About sixty-four miles of the division may be classed as affording the ordinary facilities for the construction of canal, twenty miles as difficult, and twenty miles as very difficult. Ten miles of the very difficult lies above, and ten miles below Blairsville.

The Conemaugh and Kiskiminitas throughout their whole course from Johnstown to the Allegheny river, a distance of seventy-four miles, are narrow streams, with high, steep banks, well adapted for slack water navigation There is on the division about twenty-seven miles of slack water, and it would have been advantageous, had the proportion to that of canal been greater.

On the thirty miles of canal between Johnstown and Blairsville, the average fall of the river is upwards of eight feet per mile, requiring equal to one lock per mile. Below Blairsville to the Monongahela, the fall is but three feet per mile, requiring equal one lock to two miles and a half.

The law of 1828, authorizing the commencement of the western division of the Pennsylvania canal, directed the construction of the canal "from Pittsburg to the mouth of the Kiskiminitas," both of which points are on the east side of the Allegheny river. It is evident that a great error was committed in locating the canal on the western side of the Allegheny, as the navigation of the canal is necessarily dependent on the permanency of the aqueducts across that river. These aqueducts are of feeble construction and their arches of great span.

On the commissioners visiting and inspecting the older part of the division between Blairsville and Pittsburg, it was obvious to them all, that extensive repairs, to remedy the original defects of the work, were necessary, before a secure navigation could be expected; and it was concluded that it was better to interrupt the navigation during the present year than afterwards.

The commissioners, therefore, passed the following resolution:

"Resolved unanimously, as the board are convinced by personal inspection of the western division of the Pennsylvania canal, that immediate and extensive alterations and repairs of the canal between Blairsville and Pittsburg are necessary, to correct the errors of its original construction, and to secure the works and enable the the canal to bear the depth of water contemplated at its commencement: that the supervisors on their respective portions of said line, be and they are hereby directed to draw off the water from the canal on Monday the 16th day of August next, and that they take immediate measures to make, with all practicable expedition, such repairs, &c. of the canal, locks, dams, culverts, aqueducts, &c. as

by the engineer, on the western division, shall be designated as necessary to the security and complete navigation of said line, and as he may think it practicable to effect, so as to again admit the water into the canal by the 20th day of October next."

The agents on the division acted with great energy, and within the time prescribed, effected the most essential repairs. Several of the locks have been rebuilt entire, and others partially so, several culverts have been rebuilt, the aqueducts have been repaired and strengthened, the dams, &c. have also been repaired, and it is hoped rendered secure. The commissioners are satisfied that all was effected that it was possible toeffect within the time allowed.

The sum expended in making the necessary repairs has been considerable, but the amount is moderate, when the extent of work done is taken into view. The part of this division repaired is now in good navigable order.

The act of 28th March, 1830, authorized the construction of that part of the western division leading from section No. 57, of the Ligonier line, to a suitable point for the connexion of the portage road and the canal at Johnstown. The distance from the head of the basin, at Johnstown, to section No. 57, of the Ligonier line, is three miles and a half.

The estimated cost of this work, made by Sylvester Welsh, the principal engineer on the division, in April, 1830, was seventy thousand one hundred dollars.

The actual cost completed, is sixty four thousand two hundred and fifty five dollars.

The following are the principal works, and their cost:

Sections—including two thousand and eighty-nine perches of wall,	$18,192 31
1 basin, of eight acres and and a half, and a towing path of one thousand four hundred and seventy feet,	1,693 28
3 locks, of cut stone masonry, laid in hydraulic cement, Built in the best style, and including lock sections.	13,751 85
1 aqueduct—length of trunk forty-five feet, width eighteen feet, stone abutments, superstructure wood,	3,720 00
1 aqueduct over the Conemaugh river—two spans, length of trunk one hundred and sixty-three feet, width seventeen feet. Piers and abutments contain one thousand eight hundred and eighty-five perches of cut stone masonry, laid in cement—also, one hundred and sixty one thousand feet, board measure, of timber, and six thousand five hundred pounds of iron; the structure is roofed and weather-boarded,	13,050 00
5 culverts, whole span twenty feet,	2,660 00
2 waste wiers, one hundred feet,	360 00

1 dam across the Conemaugh, one hundred and forty feet long, six feet high, stone abutments, crib work, filled with stone and sheeted,	1,219 00
1 guard bank, four hundred and five feet long, top twelve feet wide and seventeen feet and a half above the bottom of the canal,	587 00
1 water way forty-three feet long, thirteen feet high, four gates—one hundred and forty-one perches of masonry,	$ 1,158 45½
3 lock houses,	1,165 00
Fencing required,	805 00
Roads,	282 00
1 dam and waste wier connected, one hundred feet long and eleven feet high,	1,539 84
2 road and one farm bridges—fifty feet span and eighteen feet wide—stone abutments, superstructure of wood, trussed with iron,	2,240 00
3 water ways around locks,	1,245 46
Add proportion of expenses of engineers, superintendent's pay, and all other charges, for ten months,	650 24
	$ 64,255 00

The work was completed and navigated within seven months of the day of first letting and contract.

The work on that part of the Ligonier line, extending from section No. 57, to Blairsville, about twenty-six miles and a half in length, was commenced in the beginning of the year 1829.

The original estimated cost, made in November, 1828, for this part of the line, and subsequent to the letting in the fall of 1828, was four hundred and fifty-two thousand five hundred and seventy eight dollars and thirty-one cents. The estimate made by Mr. Welsh on his becoming principal engineer in 1829, and reported in November of that year, was six hundred and forty-one thousand seven hundred and thirty-two dollars and seventeen cents.

The actual cost of this part of the line, completed, will be six hundred and forty-four thousand one hundred and seventy-eight dollars and seventy-four cents.

The following is a statement of the principal works on this part of the line, and their respective costs:

Sections—excavation, embankment, &c.		$ 242,398 49
Slope walls, not included in the cost of sections,		5,897 14
Lock sections, guard and lift,		14,228 07½
4 guard locks, 27 lift locks,	Cut stone, laid in cement,	26,802 98
		161,798 19

Aqueducts—One of seventy five feet in length and nineteen feet in width, constructed of cut stone, arches, abutments and piers,	$ 18,184 00	
One at Laurel Run, forty-five feet long, eighteen feet wide, stone abutments, superstructure of wood, trussed with iron,	3,925 00	
One at Lockport, cut stone abutments, piers, arches and trunk. In the work there are five arches and contains eight thousand six hundred perches of masonry in mortar—whole length three hundred and eighty-three feet, width of trunk nineteen feet,	57,100 00	
		74,209 00
4 dams—whole length one thousand five hundred and sixty-seven feet, whole height fifty nine feet and a half, crib work filled with stone, covered with timber and gravelled,	39,187 45	
Dam abutments of stone masonry,	8,660 21	
4 dam sections,	4,122 87	
Pier heads,	3,634 45	
		55,604 98
27 water ways or sluices, around locks,		8,201 74
8 culverts—stone masonry laid in cement, built in the best style and carefully secured, whole span about seventy feet,		9,112 20
11 waste wiers, entire span about five hundred and eighty feet,		5,733 55
28 lock houses,		10,663 00
Fencing,		3,429 93
Roads,		727 33
Puddling, not included in other contracts,		2,308 80½
Bridges—twelve road, eleven farm and six towing-path bridges. The road bridges have stone abutments, the superstructures strong truss-work, and extending the full width of the canal.		11,063 83
Contingencies—superintendence, engineers, stationary, &c.		12,000 00
		$ 644,178 74

The new line from Blairsville to Johnstown was so far completed that it was opened for navigation in the month of November, to within a few miles of Johnstown. The water has been admitted

from the head of the basin through the three miles and a half of canal, authorized the 28th of March last, and placed under contract the 10th of May. Having been completed for regular navigation within seven months from the day of contract, although an unusually large proportion of mechanical work was necessary on the line. Packet boats passed up to Johnstown and returned on the 10th of December. The whole line proves to be excellent canal; not one breach has occurred since it was filled for navigation. The report of the engineers and superintendent on the division are referred to for details.

That part of the western division which extends from Blairsville to the Allegheny river, was estimated in November, 1827, to cost four hundred seventy four thousand seven hundred dollars. The actual cost, completed, exclusive of repairs, made since the first of June last, will be one million fifty-five thousand four hundred eighty three dollars and ninety-seven cents.

The original estimates of the cost of that part of the division from the mouth of the Kiskiminitas to Pittsburg, taking the course the canal runs and including two aqueducts over the Allegheny and the line extending through Pittsburg to Monongahela river and the branch to the town of Allegheny, was five hundred and twenty three thousand seven hundred and ninety-six dollars and eighty cents. The actual cost, completed, exclusive of repairs made since the first of June last, will amount to nine hundred and ninety-five thousand dollars.

The original estimates for the whole western division amounted to fourteen hundred and ninety-eight thousand nine hundred and ten dollars and ten cents. The actual cost, completed, will be, including repairs to the last day of the present year, about two millions eight hundred thousand dollars.

THE SUSQUEHANNA DIVISION,

Commences at the termination of the eastern division, at the outlet lock at Duncan's island, and runs along the west side of the Susquehanna river, through the counties of Perry, Mifflin, and Union, and terminates at the south end of the towing path bridge at Northumberland. The whole length of the division, measured by the towing path bank, is thirty-nine miles.

The country through which this canal passes is favorable for a canal. The bottoms are wide and gently sloping to the river, giving the choice of level; few obstacles present themselves. The excavation is easy and material for banks good. Not more than four miles of the division presents any difficulties, and these not great.

The original estimate for constructing this division, was five hundred and ninety-eight thousand three hundred and seventy-six dollars and thirty-two cents.

It is now ascertained that the actual cost of this division, is one million thirty-nine thousand two hundred and fifty-six dollars and seventy-seven cents, inclusive of the bridge over the Susquehanna river.

The canal is in navigable order.

The whole amount of lockage on this division, from the surface line of the pool round Duncan's island, to the surface line of the pool at Northumberland, is eighty-six feet and a half. The surface of the pool at Northumberland, is four hundred and eighteen feet above tide.

Cost of constructing the sections, excavation, embankment, &c.		$545,232 41
Wall,		7,897 93
11 locks,		107,398 43
Dam at Shamokin—first cost,	$21,434 08	
Repairs,	28,385 73	
Schute,	11,437 46	
Extending the schute,	2,960 00	
		64,217 27
3 aqueducts,		15,443 76
15 waste wiers,		2,464 94
26 culverts,		18,814 92
Road and farm bridges,		89,505 88
Towing path bridge over Susquehanna at Duncan's island, which was built under the superintendent of the Susquehanna division,		$73,454 85
Ice breakers above said towing path bridge,		2,050 90
Roads,		3,962 03
Fences,		16,515 46
10 lock houses,		7,422 70
Dam at Snyder's mill, on Penns creek,		3,194 62
Ditto, on section No. 26,		532 80
Feeders,		9,121 04
Mound,		13,993 51
Basin and lock, on section No. 1,		4,599 82
Repairs,		1,085 54
Contingent expenses, paid attorney's fees,		300 00
Damages paid,		1,437 50
Miscellaneous expenses,		19,784 27½
Engineers, superintendents, &c.		31,027 18
		$1,039,256 77½

THE WEST BRANCH DIVISION,

Of the Pennsylvania canal, commences at the south end of the towing path bridge across the western arm of the Susquehanna, at Northumberland, and runs along the east side of the stream, through the county of Northumberland, to the feeder dam at Muncy Hill, a distance of twenty-three miles and one quarter. The towing path extends along the pool some distance farther, making the whole length of navigation, twenty-four miles and a half.

No part of this division can be classed as difficult. The river bottoms are very wide, their slopes gradual, the lands generally cleared, very little rock is met with. The soil is sandy loam and

gravel, of course the excavation easy, the lockage is very inconsiderable.

The width of the canal at bottom, is twenty-eight feet, forty feet at top water line, the depth four feet. In its course there are six lift locks, and one guard lock, all constructed of wood and stone, they are seventeen feet wide, by ninety feet long, clear, in the chambers. Seven lock-keepers will be necessary.

The whole rise and lockage from the surface line of the Shamokin pool, at Northumberland, to the surface line of the pool, at Muncy, is forty-one feet. The comb of Muncy dam is one foot above canal level at the guard lock, and nine feet above low water in the river below the dam. The pool extends above two miles.

The original estimated cost for the construction of this branch of the canal, made in August 1828, was one hundred and ninety-seven thousand, eight hundred and fifty-one dollars.

The canal was filled for navigation in November, 1830.

The actual cost of this division, excluding damages to land, is now found to be four hundred and twenty one thousand, seven hundred and seventy-one dollars.

The following is a statement of the principal works, and their cost:

Sections, including excavation, embankments, &c. and 88,464 perches of wall,	$188,827 53
Towing path round Muncy hill,	15,369 06
Slope walls at locks, &c.	1,957 27
7 lift locks, one guard lock and iron wicket gates,	38,506 00
The locks are constructed of wood and stone, dry walls of rough stone, are laid and planked in the bottom and sides, to timber, secure to the walls by iron bolts.	
Cost of the feeder dam across the Susquehanna, at Muncy ripples,	23,578 64
The dam at Muncy, constructed of crib work, filled with stone, covered with spars, the space between the stone abutments is nine hundred and seventy-three feet, the wier of the dam is eight hundred and sixty-three feet, the schute thirty-eight feet, the height of the comb of the dam is nine feet, and the comb of the schute five feet above low water mark of the river.—The dam is twelve feet high from the bottom of the river.	
1 aqueduct over Chillisquaque creek. Length between the abutments, one hundred and sixty feet, abutment and piers rubble masonry, superstructure wood, cost	5,086 36
13 culverts, constructed of stone, whole span eighty-six feet,	15,520 45
5 waste wiers, whole overfall two hundred and fifty feet, cost	1,947 00

6 lock houses,	1,980 00
Basin at Northumberland, cost	1,854 40
Paid for making roads,	2,113 62
Towing path bridge at Northumberland—length between abutments, one thousand two hundred and ninety feet, stone abutments and piers, superstructure wood, cost	57,490 51
85 farm and 14 road bridges, cost	25,084 28
33 miles of fencing,	10,928 41
Repairs,	4,886 65
Contingent expenses,	2,945 38
Engineers,	15,553 25
Superintendents, clerks, &c.	5,265 90
Real estate,	575 00
Damages paid,	1,401 44
	$421,771 00

THE NORTH BRANCH DIVISION

Of the Pennsylvania canal, commences at the canal basin, in the town of Northumberland, and runs a northeasterly course, along the northern bank of the Susquehanna, through the counties of Northumberland, Columbia and Luzerne, to the entrance of the Wyoming valley.

The whole length of the division, from the point at which it intersects the west branch, in the basin at Northumberland, measured by the towing path bank to the feeder dam, at Nanticoke falls, is fifty-five miles and a half.

The country through which this division is formed, is generally highly favorable for the construction of the canal. Not more than eight miles can be classed as difficult. The river bottoms are generally wide, and the excavation easy. The material for banks good.

The width of the canal, at bottom, is twenty-eight feet, water line forty feet, depth of water four feet. In its course, there are seven lift and one guard locks, constructed of wood, width seventeen feet, length ninety feet, clear, in the chambers.

The rise from the top water line in the basin, at Northumberland, to the surface line of the pool, at Nanticoke, is sixty eight feet and eighty-nine hundredths. The comb of the feeder dam at Nanticoke, is eight feet and thirty-four hundredths above low water in the Susquehanna, and one foot and thirty-four hundredths above four feet water in the canal. The dam carries a pool five miles above it into Wyoming valley, and within two miles and a half of Wilkesbarre.

Ths original estimate of cost for this division, made in 1828, was four hundred and seven thousand three hundred and thirty-five dollars and thirty cents. The first contracts were made in 1828, the water was admitted in November, 1830; the actual cost of the canal, excluding damages to lands, is now ascertained to be one

million ninety-six thousand one hundred and seventy-eight dollars and thirty-five cents and a half.

The following is a statement of the principal works on the division, and of their respective cost:

Cost of sections, excavation, embankment, &c.	$ 661,456 03	
202,892 perches of outside wall,	125,695 64	
171,270 yards of inside wall,	34,232 63	
		$821,384 30
Cost of one guard and seven lift locks,		32,479 97
Feeder dam across the Susquehanna at Nanticoke falls—crib work filled with stone, covered and gravelled, abutments of rubble masonry, the length between the abutments seven hundred feet, and twelve feet average height from foundation, cost,		29,311 25
Contracted for in 1828, finished for use November 29, 1830.		
5 stone culverts—Their whole span twenty-six feet,	5,262 69	
24 wooden ditto,	2,858 62	
		8,121 31
4 waste wiers and two safety gates, whole length one hundred and thirty-six feet, cost, (1 more wanted, $500)		6,583 58
5 aqueducts—Longest one hundred and seventy-two feet, shortest seventy-four feet, length of the whole between the abutments, five hundred and fifty-four feet. The abutments and piers of stone, superstructure wood, width of the trunks from twenty-two to twenty-eight feet,		25,003 02
A towing path bridge forms part of the superstructure.		
8 lock houses,		3,200 00
8 basins—Their aggregate cost about four thousand five hundred dollars, but they were estimated with the sections; they are about three hundred feet long by one hundred feet wide.		
About six miles of road, cost,		57,978 90
61 farm, 17 road, 1 foot and 2 towing path bridges, cost,		40,241 27
Excluding seventeen thousand four hundred dollars the cost of embankment estimated with the sections.		
26½ miles of fencing, (25 miles more wanted $6,300)		6,596 62
Repairs,		6,920 18¼
Contingent expenses,		3,403 87
Engineers,		28,094 88
Superintendents and clerk,		3,970 50

Damages,	$,801 25
1 water pipe and syphon,	286 50
Ice breakers wanted,	660 00
Clearing creek,	2,900 94
1 lock house built,	240 00
7 more required.	
Beside the above, fifteen thousand dollars will be required for bridges, lock houses, fencing, &c.	15,000 00
	$1,096,178 34½

8 lock-keepers wanted.

THE DELAWARE DIVISION

Of the Pennsylvania canal, commences at Bristol, on the Delaware river, and runs along that stream through Bucks and Northampton counties, to Easton. The whole length of the division, measured along the towing path bank, from the tide basin at Bristol, to the northern side of the feeder dam across the Lehigh at Easton, is fifty-nine miles and three fourths.

The country along this division, presents about thirty miles of surface extremely favorable for the construction of a canal, about sixteen miles less favorable, and fourteen miles that is difficult, and along a considerable portion of which the river bluffs or cliffs, are high, steep and rocky.

On this division, the width of the canal at bottom is twenty-five feet, at top water line forty feet, and its depth of water five feet. In its course, there are twenty-three lift locks, ranging from six to ten feet lift, also two out-let and two guard locks. The canal and locks are arranged for boats of sixty-seven tons burthen. Eighteen lock-keepers are necessary on this division.

The rise and lockage from mid tide at Bristol, to the level of the comb of the feeder dam across the Lehigh, at Easton, is one hundred and sixty four feet. The comb of the dam is twelve feet above low water in the Delaware, at the out let lock immediately below the dam.

The original estimate for constructing this division, was six hundred and eighty-seven thousand dollars. The first letting took place in October, 1827. The filling the canal for navigation, in its whole course, commenced in October, 1830.

It is now ascertained that the actual cost of the division, exclusive of damages to property, will be one million two hundred and three thousand seven hundred and sixty-five dollars and five cents. The amount of damages paid on this division, prior to the 1st of November, 1830, was thirty-four thousand two hundred sixty-two dollars and sixty-four cents.

The following is a statement of the principal works, and their respective cost.

The stone work of the locks, aqueducts, culverts, bridges, abutments, &c. on this division, is generally rubble masonry.

Cost of constructing the sections, excavation, embankment, &c.	533,986 52
230,191 perches of outside wall, cost,	147,091 54
37,594 perches of inside wall, cost,	34,490 17
Expenditures in making roads, but which, in the engineers estimates, are returned as expenditures for constructing sections. This sum includes the cost of ten thousand perches of stone wall, properly chargeable to the cost of roads,	30,473 54
Cost of 23 lift-locks,	108,715 70
Cost of 2 guard locks and 1 out let lock,	21,794 30
Tide lock at Bristol,	9,590 00

The lift locks are eleven feet wide and ninety-five feet long, clear, in the chambers, &c. They are constructed of rubble masonry laid in cement, on timber bottoms with longitudinal sills and upright posts, faced with plank spiked to the timbers. The tide lock at Bristol, guard lock at Easton, and the out-let lock into the river Delaware, from the pool at Easton, are twenty-two feet wide by one hundred feet long, clear, in the chambers. The guard lock at New Hope, is eighteen feet by one hundred feet, and affords a communication with the river Delaware.

Feeder dam across Lehigh, at Easton, crib work filled with stone, and gravelled, three hundred and seventeen feet long and twelve feet high,	$ 9,000 00
9 aqueducts, the shortest twenty five feet, the longest one hundred and seventy eight feet between the abutments, length of the whole six hundred and thirty one feet; the abutments and piers are of rubble masonry, the superstructure of wood, trunks twenty feet wide. Towing path bridge forming part of the superstructure,	63,005 98
20 culverts, rubble masonry laid in cement. The span of the whole is one hundred and thirty eight feet,	24,863 63
19 waste wiers, with sluice gates—woodwork with protections of masonry. The whole overfall is one thousand four hundred and forty one feet,	23,783 45
16 lock houses built,	9,200 46
Tide basin of five acres and a half, constructed in the Delaware, and pier at Bristol, nearly finished, estimated lately to cost, when completed,	33,000 00
47 road bridges, stone abutments, superstructure of wood, embankments included,	34,552 34
49 farm bridges, as above,	24,388 78
3 turnpike, and 3 foot bridges,	5,114 96
52 miles fencing along canal,	12,182 13

Paid for alterations and for repairs before supervisors were put on the division,		25,297	88
Incidental expenses, postage, books, paper, &c.		2,441	69
Paid engineers, superintendents and other officers, for surveys,		43,672	04
Cost on one culvert and 15 waste wiers, which were afterwards dispensed with, or the plan of location altered,		2,239	92
2 lock houses and collector's office,	$ 1,350		
Fencing yet required, about twelve miles,	2,920		
A foot bridge ordered,	200		
Water ways around locks,	2,500		
		6,970	00
Add damages already paid,		34,262	64
		$1,238,027	69

THE DELAWARE DIVISION

May be fairly considered as an extension of the Lehigh coal and navigation company's canal; it will therefore be proper to bring this canal into view, in connexion with the Delaware division, more especially as this division must derive its principal business and income from the transportation of coal, which must first pass down the Lehigh canal.

The Delaware division unites in a pool of the Lehigh, at Easton, with the canal owned by the Lehigh coal and navigation company.

The Lehigh canal is of the most substantial character, and does high credit to the enterprize of the company at whose expense it was constructed, and to the science and economy of the engineers and officers who had charge of the work. The canal runs from Easton to Mauch Chunk, a great part of it through an extremely difficult country, having a very large amount of lockage to overcome in its rocky and precipitous course. The canal has forty five feet width at bottom, sixty feet surface, and five feet depth of water. Its locks are twenty two feet wide, and one hundred feet, clear, in the chambers; are calculated for single boats of one hundred and forty tons, or double boats of seventy tons. It is forty six miles long, in which distance there are forty seven lift, and six guard locks, and nine dams. The whole lockage from low water in the Delaware, at Easton, to the head of the canal, at Mauch Chunk, is three hundred and sixty feet and eighty seven hundredths. It was finished for use in June, 1829, about two years after its commencement.

The whole cost of its construction, exclusive of damages paid and rights purchased, was one million three hundred thousand dollars.

Forty-six thousand tons of coal passed through this canal, since April 1st, 1830.

The Morris canal connects with the Delaware river at the Jersey side, directly opposite the junction of the Delaware division and Lehigh canal, and runs across New Jersey to the tide waters in the

bay of New York. This canal is nearly finished, and besides its other business, will be a channel for the transportation of the Lehigh coal to Jersey, and the city of New York. It will no doubt be a line of communication that will create some business on the Delaware division.

Under the provisions of the fourth section of the act making further provisions for canals and roads, passed in March last, F. W. Rawle, engineer on the west branch, was directed to make "a survey, plan and estimate, of a canal and lock communication from the nearest and best point on the west branch canal, to the Susquehanna river, at or near the town of Lewisburg, in Union county." The report of Mr. Rawle is herewith submitted, shewing that the length of said communication will be three thousand four hundred feet, that three locks will be required, also a dam across the west branch; and that the whole work will cost twenty five thousand two hundred and sixty-six dollars and forty nine cents.

The same act directs "a like survey, plan and estimate of a canal and lock communication, from the nearest and best point on the canal, at or near Harrisburg, to the Susquehanna river." The duty was assigned to E. F. Gay, engineer on the eastern division. His report, herewith submitted, shews that the canal will have a length of seven hundred and ninety two feet—two locks, each eight feet lift, and is estimated to cost twenty five thousand eight hundred and eleven dollars and eleven cents.

The board are of the opinion, that the forming of these connexions with the Susquehanna, river will operate advantageously to the canal, and will afford valuable facilities to the citizens of the surrounding country.

The propriety of authorizing the construction of an outlet lock from the eastern division of the Pennsylvania canal into the Susquehanna river at Columbia, is recommended.

Many of the coal and other arks and boats intending to run to the tide water at the mouth of the Susquehanna, will enter the canal from the upper parts of the river, and descend it, provided they can again have admission into the Susquehanna, so as to pursue their destined course. Boats also which have descended the river during a time of favourable water will ascend the canal, provided they can be admitted into it, and a considerable increase of tolls will ensue. This arrangement will be beneficial to the coal trade of the Susquehanna, as well as to other interests, and has been especially recommended to the board as of importance to the citizens of Wyoming valley.

On the subject of extending the Pennsylvania canal system, the board of canal commissioners remark: that the time is not distant when the increasing population of the northern, western and other regions of the commonwealth, will successfully demand the benefit of canals and rail-ways amongst them.

Whether it is at this time within the power of the commonwealth, with due reference to her credit, to meet the interests and desires of such portions of the state as now claim to be embraced within

the range of improvements by canals, will depend on the facts that may present themselves before the legislature, during the present session. The board will merely bring into view those improvements which they think it desirable to be made as early as practicable, consistent with the general credit of the state. They are as follow, viz :

First—The continuation of the canal along the north branch of the Susquehanna, from the head of the Nanticoke Pool to the New York state line.

Second—The continuation of the canal or the arrangement of a slack water navigation along the west branch of the Susquehanna, from the head of the pool at Muncy, to the mouth of Bald Eagle creek.

Third—The improvement of the navigation of the Monongahela river, by means of slack water navigation, from near Pittsburg, at least to Brownsville.

The forming a communication from Pittsburg to Erie Harbour, by means of a canal, slack water or rail-way, or by a connexion of these several means, by way of either the Beaver and Shenango, or the Allegheny.

The immediate extension of the north branch canal to the mouth of the Lackawannock, is of importance, as giving facilities for the shipment of the anthracite coal along the whole line through the Wyoming valley, which by passing down the north branch, Susquehanna and eastern divisions, will give business and tolls to the canals.

The final extension to the state line, will by a canal for a distance of sixteen miles from thence to Elmira, give a connexion through the Chemung and Seneca canals, and the Seneca and Cayuga canal with the great Hudson and Erie canal, and so will open a communication to all the interior of the state of New York. The route from the waters of the Susquehanna to the Seneca lake was deemed of sufficient importance to warrant an examination and survey by authority of the legislature of Pennsylvania as early as the time of Governor Snyder.

The extension of the west branch to Bald Eagle, so as to reach the bituminous coal region, is important, as this species of coal is of particular value in certain branches of manufactures, and as it bears a higher price in the same market than the anthracite coal. It is the true policy of Pennsylvania to cherish all her manufacturing establishments, and the rendering coal abundent and cheap is one evident means of favoring them.

The extension of the French creek feeder or canal, from its present termination to the mouth of French creek, will be of evident advantage. At present it has no beneficial communications.

The construction of a canal or slack water navigation from the mouth of Beaver creek to a point near New Castle, will be of importance to a considerable population. At one end it will be connected with the Ohio river, and form a line of communication common to the meditated canal to Erie, as well as with the canal proposed to be extended from New Castle to the Ohio canal.

The second section of an act, passed the 22d April, 1829, made it the duty of the board of canal commissioners to locate the route of a suitable navigation, either by canal or by canal and slack water, between the city of Pittsburg, or the mouth of the Kiskiminitas, and the borough of Erie, within the year 1829. With the requisitions of this act the board did not comply; but on the 17th December, 1828, when a resolution, declaring an actual location, in compliance with the law, was under consideration before the board, a substitute was offered, which stated that the board could not then make the location, but which contained an opinion in favor of a route from Pittsburg, by the Shenango to Erie. The substitute was adopted, one member voting against it. Thus a location, according to law, was not made, although a majority of the members appear, by the minutes, to have been in favor of a location on a particular route

The improvement of the Monongahela river by slack water, will be of evident advantage to the population bordering upon it. All the work necessary can be effected in one season, as the building of three or four low dams, and of as many river locks is all that will be required, in order to establish a steam boat navigation to the national road at Brownsville. The improvement of the river will facilitate the passage of the produce of the country along the Monongahela to Pittsburg, so as to take the line of the Pennsylvania canal to Philadelphia.

The following is a statement of Tolls received on the Pennsylvania canal, up to the 1st day of December, 1830.

ON THE WESTERN DIVISION.

The amount of tolls received by Thomas Johnston, collector at Blairsville, previous to the 1st November, 1830,	$7,224 79¾	
Received from the 1st of November to the 1st of December, 1830,	1,217 34	
		8,142 13¾
Amount of tolls received by David Brenneman, collector at Leechburg, prior to the 1st day of November, 1830,	3,406 63	
Received from the 1st to the 29th November, 1830,	783 89	
		4,190 52
Amount of tolls received by W. B Foster, collector at Pittsburg, up to the 1st November, 1830,	2,779 11	
Received from the 1st to the 30th November, 1830,	366,32	
		3,145 33
Whole amount of tolls received on the western division,		$15,777 98¾

EASTERN DIVISION.

The amount of tolls received by Thomas C. Reed, collector at Harrisburg, prior to the 1st November, 1830,	3,502 49½	
Received from 1st November to 1st December, 1830,	1,400 00	
		4,902 49½

JUNIATA DIVISION.

The amount of toll received by L. Reynolds, collector at Lewistown prior to the 1st November, 1830,	395 36	
Received from the 1st to the 20th November, 1830,	359 06	
		754 42
		$21,434 90½
Amount of tolls received at the bridge over Duncan's island, up to 1st of December, 1830,		5,578 00
		$27,012 90½

On the subject of damages the commissioners have only to remark that the enactments of the legislature cannot be too maturely considered as to their bearing. The commissioners are sworn to obey the principles contained in the laws as they exist, and cannot administer them as a portion of the citizens desire them to be understood. Whatever principles may be adopted and practised on, should be stable and uniform in their character, as otherwise the patriotic, the liberal or necessitous may accept the awards made them under the existing laws, whilst other claimants to whom awards may have been made, bearing a due relation to such as have been accepted, await to have their claims decided under other laws, framed on other principles.

The existing laws require that the commissioners and appraisers shall take into consideration the advantages as well as the disadvantages to the property and landed estate through which the canal shall pass. In judging of these, the parties making claims for damages invariably urge the equal benefits which some neighbour derives from the canal without losing any portion of his lands or suffering any injury, whilst he fails to take into view the fact, that his own estate is enhanced in value, or to consider the disadvantages to the citizen of other parts of the Commonwealth, from whose roads transportation, travel and business are diverted, and who, without sharing any direct portion of the benefits of the canal or of the expenditures during its construction, is required to stand responsible for his quota of the public expenditures.

It is a singular fact that on those divisions of the canal on which the smallest awards were made, the parties have generally accept-

ed the amount offered; whilst on those divisions on which the largest offers were made, the law relating to damages has been disapproved and the awards made under it, in many instances, rejected.

Since the first of July last the board have considered and decided on upwards of three hundred cases of claims for damages. A number are yet pending, to which the board could not give the necessary time and attention, consistent with what they deemed their primary duty, to wit: the necessary ar angements for the completion of the canal within the present year.

The laws provide that when the canal is finished, or within one year thereafter, persons deeming themselves injured, may present their claims for damages, and therefore but few claims have yet existed upon the commissioners to give their time to the subject of damages in preference to other duties. The commissioners cannot forbear to urge upon the legislature the necessity of their preparing and enacting a code of laws for the government of the Pennsylvania canal and rail-way. It is material that a well arranged system for the regulation and government of the extensive interests involved in these works should be matured. Well defined and efficacious laws, distinct in their purport and admitting promptitude in their application will be found absolutely necessary.

It is true the legislature have invested the canal commissioners with certain powers to enact regulations for the government of the canal and rail road, but it ought not to be expected that a few individuals, having numerous duties to perform and limited to an acquaintance with the local interests of parts only of the state, should devise a system as perfectly adapted to the general interest, as that body representing all the localities of the commonwealth, and from whose greater numbers a proportionate degree of weight and intelligence may justly be expected. The making of laws is a duty which especially appertains to the legislature. It cannot be expected that the citizens of the commonwealth will acquire as early an acquaintance with laws enacted by a board of commissioners as if they had been the subject of legislative discussion. By the debates in the legislative body not only the representatives from every part of the commonwealth acquire a knowledge of the laws and the policy and wisdom in which they are founded, but the reasons of the law are promulgated and diffused amongst the citizens at large, who stand ready to yield obedience and support to the acts of the highest authority of the land. The passage of laws through all their deliberate forms, discussed and sanctioned by the representatives of the peop'e and approved by the chief magistrate of their choice, ever will meet a respect which will be yielded to no subordinate power.

The legislature will find on the minutes of the board an extensive system prepared by the canal commissioners and adopted under the powers imparted to them by the legislative act of 1830. This system though imperfect may be found useful in enabling the legislature to arrange a better.

On the 20th of March, 1829, the former board of canal commissioners passed the following resolution: "Resolved that the superintendent and engineer on the French creek feeder be directed, during the ensuing summer, to survey and plot definitively that portion of the contemplated canal between Conneaut lake and the basin at Erie, by the route reported by the board to the legislature at its present session, and report to this board, when completed, the estimate of expense of construction, with profiles and maps of the same."

Mr. Ferguson, the then principal engineer upon the feeder having been transferred to the Juniata division, this duty was afterwards assigned to B. B. Vincent, the principal assistant engineer on the feeder. His report and estimate are herewith submitted; as also a report and estimate of the same line, made by Wm. Dickson, the former superintendent upon the feeder.

Under the provisions of the 2nd section of the act of the 27th of March last, making further appropriations for canals and roads, the board, on the same day on which the law was passed, opened a correspondence with three skillful and experienced engineers with a view to the examination of the different routes for crossing the Allegheny mountain. Owing to other engagements of the engineers, designated the organization of the party for making the the surveys and examinations contemplated by the legislature, was unavoidably delayed until late in the month of July. The engineers appointed were Moncure Robinson, Col. Stephen H. Long, and Major John Wilson. They were instructed by the board in making their examinations under the provisions of the act of assembly, to take into view a portage by means of a road so graded as to admit of its being adapted either to a Macadamized turnpike or to a rail-road In the course of the summer a thorough examination of the mountain has been made. The engineers were not enabled to close their examinations until some time in the present month nor to make any communication until their report, in part, of the 18th instant, which was received by the board on the 20th, and which is herewith submitted, relating to the route and plan of crossing the mountain.

This report, together with the report upon the same subject made by Moncure Robinson in 1829, will furnish such facts as are necessary to come to a conclusion as to the route and manner of crossing the Allegheny mountain. No estimate of the cost has yet been received, the engineers not having had time to report upon that subject.

Signed by order of the board,

JAS. S. STEVENSON, *President.*

ATTEST.

FRS. R. SHUNK, *Secretary.*

Harrisburg, December 21, 1830.

Document No. 1.

To the Board of the Canal Commissioners of the State of Pennsylvania:

GENTLEMEN:

In conformity to an act of the Legislature of Pennsylvania, dated on the 27th of March, 1830, authorizing the appointment of Engineers for the performance of certain duties therein specified, the undersigned having had the honour to be selected by the Board of Canal Commissioners, to carry into effect so much of said act as relates to the Allegheny Portage, and having devoted, so far as it has been practicable, their careful attention to the several subjects confided to their decision, embrace this early opportunity to report, *in part*, the facts developed by their investigations, together with a few of the leading conclusions to which they have been enabled to arrive. They at the same time beg leave to apprize the Board of Canal Commissioners, that the lateness of the season, at which their field operations were unavoidably commenced, and the inadequacy of the force employed in the execution of the complicated surveys that have been deemed essential to a proper knowledge of the several routes claiming attention, render it utterly impracticable to present at this time a full report, embracing all the topics connected with the duties in which they have been engaged, and for which their services were required.

The first object to which the attention of the engineers was directed, was that of ascertaining the localities and other circumstances connected with the several routes that have been proposed. With this object in view, they had recourse to the various documents relating to the Allegheny Portage, that have on former occasions been submitted to the Legislature. From these it appeared that the first route surveyed with a view to a portage road communicating between the Juniata and Conemaugh rivers, was that explored agreeably to the directions of Canvas White, Esq. in 1827, leading from a point near the junction of the constituent branches of the Juniata, and about one and a half miles above Frankstown, to the confluence of the N. and S. Forks of the Little Conemaugh, and thence downward to Johnstown. The line run on this occasion however, is to be regarded merely as experimental, and led to no other results, except that of determining the elevations of several points, and the distances between them; very little attention having been paid either to the adoption of a system, or to its adaptation to the natural surface. With respect to the results above mentioned, it should be added, that subsequent surveys have sufficiently established their accuracy. The bench mark, made at the Bob's creek summit, in connexion with this route, has served as a land mark, to which all subsequent surveys in this direction have been referred.

The next surveys that were instituted for the same object, were made in the year following (1828,) under the direction of N. S. Roberts, Esq. These surveys embraced a comparatively broad range of country, extending from Frankstown westwardly to Johnstown, and from the Blue Knob northwardly to the Sugar run summit.

The object of these surveys, appears to have been to ascertain the practicability of a route for a rail-road, leading across the summit of the Allegheny mountain, at a uniform inclination or declivity, not exceeding one or one and a half degrees, excessive curvatures and deviations from a direct course, having been accounted less objectionable than a vertical rise or depression, greater than the limit prescribed. The routes surveyed and designated on this occasion, in addition to numerous experimental routes, which were abandoned as impracticable, amounted to no less than five in number, no part of either of which had an inclination exceeding one and a half degrees A brief description of the several routes alluded to, beginning at the most southerly, and ending at the most northerly, will here be attempted; and since they are respectively to be regarded as a link in the great chain of intercommunication, stretching through the state, from Philadelphia to Erie, as well as for the purpose of giving a better understanding of their comparative merits, it will be proper to consider them as connected with the main chain at such points as will admit of a common junction of all the routes. With this view the points selected are Frankstown and Johnstown, between which the distances by all the routes will be estimated.

	Distances in miles.	Heights of summits in feet. above Frankstown	above Johnstown
Route No. 1, by N. S. Roberts, Esq. From Frankstown, by way of M'Key's Gap, south side of Blue Knob, Bob's creek summit, Ben's creek and Little Conemaugh, to Johnstown.	51⅓	1590	1343
Route No. 2, by N. S. Roberts, Esq. From Frankstown, by way of Newry, north side of Poplar run, Bob's creek summit, Ben's creek, and Little Conemaugh, to Johnstown.	49¾	1590	1343
Route No. 3, by N. S. Roberts, Esq. From Frankstown, by way of Hollidaysburgh, south side of turnpike, Sugar run summit, Laurel run and Little Conemaugh, to Johnstown.	51	1419	1166
Route No. 4, by N. S. Roberts, Esq. From Frankstown, by way of Hollidaysburgh, Blair's Gap, north side of turnpike, Sugar run summit, &c. as in route No. 3.	50¾	1419	1166
Route No. 5, by N. S. Roberts, Esq. From Frankstown, by way of Hollidaysburgh, north side of Sugar run, Sugar run summit, &c. to Johnstown, as in route No. 3.	47⅛	1382	1129

In 1829, an examination and survey of the Allegheny portage, was executed under the direction of Moncure Robinson, Esq. in

conformity to certain principles adopted by him, as best adapted to the nature and condition of the portage, and to the exigencies of the contemplated road. Among the leading considerations recommended by this gentleman, as governing principles in the location of the road, are a reduction of the height of the summit, at the expense of a tunnel a mile long, the construction of inclined planes, horizontally direct, but varying in their inclinations from six to nine, and in one instance, to about thirty degrees; the adoption of self acting planes, as a means of conveying loads upward and downward, on the east side of the mountain; the employment of stationary power, on all of his inclined planes, to the exclusion of a power moving with its load, &c.

A majority of the board of engineers, who had as yet acquired no personal knowledge of the localities to be traversed by the contemplated road, nor of the nature of the obstacles to be overcome, were desirous of instituting a course of examinations and surveys, the leading objects of which were to obviate the necessity of constructing a tunnel at the summit, till such time as the exigencies of the trade upon the road should require it; to avoid the adoption of inclined planes having inclinations greater than five degrees, and if possible, to limit their inclination to three degrees; to provide for a route upon which not only *stationary* but *progressive* power might operate to advantage, according to circumstances; to effect a definitive location of a route upon ground most favourable for the construction of a road in regard to the principles as well as to the cost of construction, &c.

With these objects in view, and at the instance of a majority of the engineers, a party was organized early in the month of August last, and placed under the immediate direction of Lt. Col. Long, who has ever since devoted his unremitted personal attention to the field operations in which the party have been engaged, from the date of their organization to the present time. The operations of the party were performed in the following order, and lead to the results hereinafter exhibited, viz:

First, the survey of a *crest line* leading along the main summit of the Allegheny mountain from the Sugar run summit to the Cedar Swamp summit, and embracing a distance of about fourteen miles. The results obtained by this survey gave for the comparative elevations of the several gaps in the comb or crest of the mountain, the following altitudes above the level of the Sugar run summit, which last proved to be the lowest depression of the mountain, viz:

Assuming *zero* as the elevation of the Sugar run summit, its height will be, .0 feet.

Height of Blair's Gap summit above	Sugar run summit,		49
do	Adams' summit above	do	175
do	Laurel summit above	do	222
do	Big Spring summit above	do	304
do	Bob's creek summit above	do	213
do	Cedar Swamp summit above	do	167

The comparative altitude of the mountain on other parts of the crest line, as deduced from actual observations, varied from fifty to five hundred feet above the level of the Sugar run summit, 1238 to 1738 feet above Johnstown, or 1418 to 1918 feet above Frankstown.

2d. The survey and definitive location of a route for a rail-road from Hollidaysburgh to Johnstown, passing northwardly of the turnpike, from a point about one-fourth of a mile westward of the former place to a point about three fourths of a mile westward of the summit of the mountain, which is crossed by the route at the depression called the Blair's Gap summit, thence southwardly and westwardly, along the vallies of the Laurel run, and the Little Conemaugh, on the south side of the latter, to a point a little below Burk's Saw mill, where the route crosses the Little Conemaugh; thence downward on the north side of that stream, to the gorge of the Horse Shoe Bend, where it crosses the Conemaugh at an elevation of about 60 feet above the surface of low water, requiring a bridge only 500 feet long; thence downward on the south side of the Conemaugh to the gorge of the Staple bend, through which it passes in a distance of 1000 feet, at an elevation of about 80 feet above the surface of the Conemaugh, and at a depression of about 250 feet below the crest of the ridge intervening between the Conemaugh and the mouth of Deep run, requiring for its passage through the gorge, a tunnel 1000 feet long; and thence downward along the south side of the Conemaugh to Johnstown.

This route embraces eleven inclined planes, viz: six on the east and five on the west side of the mountain. Some idea of the character and properties of these planes, may be derived from the following statements, which are necessarily incomplete, in consequence of the unavoidable absence of the field notes, from which alone their precise dimensions, &c. can be drawn. The planes are numbered from east to west, in the order of their occurrence on the route from Frankstown to Johnstown.

Inclined Planes,	Inclination.	Approximate length.
No. 1 (East of mountain.)	1° to 1° 15′	about $\frac{1}{2}$ mile.
No. 2 "	2° to 2° 30′	" $\frac{1}{2}$ mile.
No. 3 "	2° 35′	" $\frac{7}{8}$ mile.
No. 4 "	2° 35′	" 1 mile.
No. 5 "	4° 35′	" $\frac{3}{5}$ mile.
	2° 53′	" 1 mile.
No. 6 "	4° 56′	" $\frac{5}{6}$ mile.
	2° 53′	" 1 mile.
No. 7 (West of mountain,)	2° 40′	" 1 mile.
No. 8 "	2° 53′	" $\frac{4}{7}$ mile.
No. 9 "	2° 53′	" $\frac{4}{7}$ mile.
No. 10 "	2° 53′	" $\frac{2}{3}$ mile.
No. 11 "	2° 53′	" $\frac{2}{5}$ mile.

In connexion with the inclined planes No. 5 and No. 6, as exhibited in the foregoing table, it will be perceived, that the statements are carried out in duplicates, the reason whereof is, that

the most direct route presented by the conformation of the hills would not admit of a graduation at an angle less than the larger inclination therein contained; also, that in order to effect a location, at an inclination not exceeding three degrees, a longer and more circuitous route would be required, as exhibited in the duplicate connexion.

Those parts of the route situated between the inclined planes, and exteriorly of them, were located at an inclination, ascending towards the summit of the mountain, in no case exceeding a rise of thirty feet in the distance of a mile, except on that portion of the route situated between Duncan's tavern, and the Hollidaysburgh bridge, about two miles, on which a rise of about 42 feet per mile, was deemed more conducive to economy.

3d. The survey of an experimental line or route leading through Newry, ascending the valley of North Poplar run, and its south branch, crossing Bob's creek near its intersection with the road leading from Frankstown to Johnstown, crossing the Allegheny mountain at a point called the Cedar swamp summit, and descending to the Conemaugh, by the vallies of the Cedar run and south fork of Conemaugh.

The uncertainty that existed in reference to the distance and facilities presented by this route, and the difficulty of forming a correct opinion as to its relative merits without an actual survey, rendered this part of the service obligatory if not essential to a competent discrimination between the several routes claiming the attention of the engineers.

The same principles that governed in the location of the Blair's Gap route were applied here, with such modifications as any change in the aspect or condition of the country through which the line passed, seemed to require. The leading peculiarities presented by this route, were a variableness in the grade best adapted to the natural surface, ranging from an ascent of ten to ninety feet per mile, on the first nine miles above Frankstown, the necessity of one or more five degree planes in passing thence to the summit of the ridge, dividing between Poplar run and Bob's creek; the occurrence of numerous ravines, and mountain spurs, requiring heavy embankments and deep cuttings, eastwardly of the main summit, and a declivity of about 40 feet per mile, on the last four miles situated immediately above the confluence of the N. and S. forks of the Conemaugh. From the point last mentioned to Johnstown, a distance of $8\frac{3}{4}$ miles, this route is coincident with the route just before described.

In addition to the routes above considered, numerous other lines were traced and levelled as preliminary to the adoption of the most favorable route, amounting in the aggregate to a distance of nearly 200 miles.

These several routes, together with that surveyed in 1829, respectively prolonged so as to embrace the entire distance from Frankstown to Johnstown, will be exhibited in continuation of the list presented in the former part of this essay, and in the following order, viz :

	Lengths of routes in miles.	Heights of summits in feet. above Frankstown.	above Johnstown.
Route No. 6, by M. Robinson Esq From Frankstown, by way Hollidaysburg, south side of turnpike, Blair's Gap summit, along the vallies of Laurel run and Little Conemaugh, crossing the latter six times, to Johnstown,	40¾	1279	1028
Route No. 7, by Lt. Col. Long. From Frankstown by way of Newry, Poplar run, Bob's creek, Cedar swamp summit, Cedar run, S. fork of Conemaugh, and Little Conemaugh, to Johnstown, crossing Conemaugh only twice,	39⅓	1514	1257
Route No. 8, by Lt. Col. Long. From Frankstown, by way of Hollidaysburgh, north side of turnpike, Blair's Gap summit, and downwards in vallies of Laurel run and Conemaugh, crossing the latter twice only, to Johnstown, crossing the summit by means of planes, limited to inclinations of three degrees,	39½	1397	1137
Route No. 9. by Lt. Col Long. From Frankstown, by way of Hollidaysburgh, &c. as in the preceding route No. 8, to Johnstown, arriving at the summit by means of two planes of an inclination less than five degrees each, the inclination of the other planes, being limited to less than three degrees,	38½	1397	1137

The several routes claiming the attention of the engineers having been thus considered, their relation to a direct line extending from Frankstown to Johnstown, deserves particular attention. Such a line, traversing the country between the points above mentioned, would have a course bearing S. 74° W. from Frankstown, and an extent of about thirty-one miles. It would cross the crest of the Allegheny mountain near the Big Spring summit, or about one and a fourth miles northwardly of Bob's creek summit. Its direction thence to Johnstown is nearly parallel to the general course of the Conemaugh from Lilly's mill to the gorge of the Horse-shoe Bend, and of course to that of the routes Nos. 6, 7, 8 and 9, which pursue the valley of the Conemaugh through that distance. Any route meriting attention from its general proximity to the direct line, and passing through either of the depressions in the summit noticed in a former part of this paper, must pass in the vicinity of Hollidaysburgh, ascend the valley of Blair's Gap run to the turnpike gate; thence pursue its main branch, and a small tributary of the latter, to

the Laurel or Adams' summit, and thence downward along one of the brances of Bear Rock run to Lilly's mill; and thence by routes Nos. 7, 8 and 9 to Johnstown. Anxious inquiries were made with a view of ascertaining the practicability of a route in this direction, which were rendered fruitless in consequence of the great elevation of those summits. With this exception no route was presented maintaining a nearer parallelism with the direct line than those passing through Blair's Gap.

A map of the country embracing the Allegheny portage, and exhibiting the several routes treated of in this essay, on a scale of one inch to the mile, is now in progress and will be presented to the board as soon as practicable. A view of such a map will impart more satisfactory information with respect to the geography of the country, the position of the several routes, and their relations to the eastern and western divisions of the Pennsylvania canal, than volumes of description could give without it.

Drawings, in plan and profile, illustrative of the horizontal and vertical positions of the located route, and of the particular topography in its vicinity, accompanied by suitable remarks on the aspect, geology, &c. will be prepared and submitted at the earliest practicable date.

An estimate of the cost of grading and bridging, as also of any other structures that may be deemed essential to a portage road, best calculated to subserve the purposes for which such a road is required, will also be submitted, in company with a final decision in reference to the manner of crossing the Allegheny mountain.

In view of what has been advanced in this paper, and in accordance with impressions derived from personal examinations of the country traversed by the several routes that have been proposed for the portage road, the undersigned feel warranted in awarding their decided preference to a route leading upward along the valley of Blair's Gap run, crossing the Allegheny mountain at the Blair's Gap summit, and descending to Johnstown, in the vallies of Laurel run and the Little Conemaugh.

The engineers having been directed by the canal commissioners, in conformity to a resolution of the board, dated March 27, 1830, to ascertain how far it might be eligible to construct a Macadamized turnpike across the Allegheny mountain, as a method for transportation, have made such surveys as were not only requisite for attaining that object, but might also be applicable for the construction of a rail-road.

The undersigned have accordingly no hesitation in giving a decided opinion in favor of the superior advantages of a rail-way over a turnpike, however well constructed, and whatever known power be applied for the propulsion of loaded carriages.

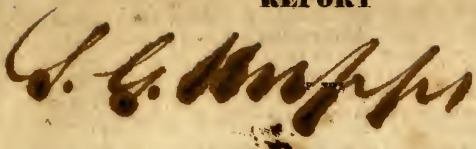
All which is respectfully submitted.

Harrisburg, Dec. 18*th*, 1830.

S. H. LONG, *Top. Eng'r. Bt. Lt. Col.*
JOHN WILSON, *Civil Engineer.*

Frs. R. Shunk, Esq.
Sec'y. Board of Canal Commisioners.

REPORT



CANAL COMMISSIONERS

OF

PENNSYLVANIA,

RELATIVE TO THE

Pennsylvania Canals

AND

RAIL-ROADS.

Read in Senate, December 15, 1831.

HARRISBURG:
PRINTED BY HENRY WELSH.

1831.

[illegible]

REPORT

OF THE

CANAL COMMISSIONERS.

CANAL COMMISSIONER'S ROOM,
December 15, 1831.

His Excellency George Wolf,
Governor of Pennsylvania.

SIR—By order of the Board of Canal Commissioners, I have the honor of transmitting to you their annual report, and accompanying documents.

JAMES CLARKE,
President.

The Canal Commissioners respectfully submit the following Report:

Since the annual report of the canal commissioners, made on the 21st of December, 1830, the members of the board have suffered severely from sickness, and have to record the death of their late talented president, by disease contracted in the discharge of his official duties. A devoted attention to the important interests which were confided to his care, a sincere desire to economize the funds of the commonwealth, and an inflexible determination to exact from her agents, made subject to his control, a fulfilment of their obligations, were conspicuous traits in his public character, which entitle his memory to be cherished with grateful respect by the citizens of his native state.

In obedience to the injunctions of the law passed on the 21st of March, 1831, entitled "An act to continue the improvement of the state by canals and rail-roads," the canal commissioners have put under contract 266 miles and 311½ perches of rail-road, canal, slackwater and towing path; of which 3 miles and 251½ perches are feeders, that were found to be necessary, as will appear from table marked No. 1. The several lettings were fixed at the earliest period it was practicable for the engineers to have their lines prepared, and for the board to attend them successively. Inasmuch as the law required the twenty miles of the Columbia and Philadelphia rail-road west of Philadelphia, to be finished and made useful for transportation with the least possible delay, the board had it first placed under contract.

There are 32½ miles of single track and 49 miles and 11 perches of double track of the Columbia and Philadelphia rail-road, and 36 miles and 221 perches of double track of the Allegheny portage road, for which contracts have not yet been entered into for laying the rails, but with this exception, table marked No. 1, contains the whole work authorized to be put under contract by the act of the 21st of March last.

In addition to those lettings, the superintendents upon the several lines have re-let, at various times, 75 sections of canal and towing path, 5 sections of rail-road formation, 29 miles of laying rails, 4 viaducts, 3 aqueducts, 13 dams, 13 locks, 13 culverts, 66 bridges, and a great variety of smaller jobs, have had to be re-let and re-re-let during the season, all of which were examined and revised by the canal commissioners. 1022 contracts have been revised and approved since the 11th of May last.

A form of contract for canal sections accompanying this report and marked A, contains the general stipulations and provisions in all the canal and rail-road contracts. The following article has been inserted in all the contracts, except those for laying the rails on the Columbia and Philadelphia rail-road: "It is further agreed between the parties, that when the superintendent on this division shall give notice in writing or by public advertisement, that the sum of money appropriated towards the expenses of this division for the present year, shall have been expended, that any subsequent labor performed under this contract shall not be considered as incurring a debt against the state, contrary to the true intent and meaning of the 7th section of the act of the 21st of March last." This was deemed indispensable, in order to comply with the obligations the board were under to carry the other provisions of the law into effect, which required them to place the work on the several lines therein named under contract, and appropriated a specific sum for each line towards the expenses thereof for the present year.

No. 1 **TINGS.**

Colu	947 20			
Fran	804 52	41,686 63	35 575 94	6,110 69
Alle	181 56	84,440 15	72,255 48	12,184 67
	505 98	75,195 76	63,984 4	11,211 12
Wyo	212 20			
Lyco	594 56	26,447 32	22,454 54	3,992 77½
Lewi	587 54	59,117 39	50,746 88	8,370 51
Frank	000 00	1,250 00	1,060 00	190 00
Beave	681 32	17,838 68½	15,136 60	2,702 08½
	317 82	42,708 96½	36,360 71¼	6,348 25¼
	242 66½	579,662 22½	499,133 25¼	80,528 97

No. 1.

TABLE OF CANAL AND RAIL-ROAD LETTINGS.

Date.	Location and description of the work.	Navigation.						Rail-road.				Number of miles of each letting.	
		Number of miles of canal.		Number of miles of slack water.		Number of miles of feeders.		Number of miles of forming road bed.		Number of miles of laying rails single track			
		M.	P.	M.	P.	M.	P.	M.	P.	M.	P.		
Downingtown, May 11th.	On the Columbia and Philadelphia rail-road from the intersection of Vine and Broad streets, in Philadelphia, to the foot of the inclined plane.							3	90				
	" From section No. 22 to section No. 59, directly south of the Warren tavern,							36	152				
	" From Broad and Vine streets westward,									20	00	59	242
Columbia, May 18th.	" From the head of the basin to the head of the inclined plane,							1	110				
	" From the head of the inclined plane at Columbia eastward to Big Conestogo,									12	160		
	On the Eastern Division between Columbia and Middletown,	8	22									22	177
Ebensburg, May 25.	On the Allegheny portage, from the basin at Johnstown, eastward to near the summit of the mountain,							26	86			26	86
Williamsburg, June 1	On the Frankstown line of the Juniata Division from section No. 184, one fourth of a mile above Huntingdon, to the pool above the basin at Hollidaysburg,	22	156	15	266							38	102
Wilkesbarre, June 15	On the Wyoming line of the North Branch Division, from the Nanticoke dam to near the mouth of the Lackawannock,	18	11	8	305	00	203½					17	199½
Williamsport, June 29	On the Lycoming line of the West Branch Division,	29	12	7	56								
	On the Muncy line of the West Branch Division, the side cut from the main canal to Lewisburg,	00	200									36	268
Franklin, July 8.	On the French Creek Division,	4	50	13	36							17	36
Beaver, July 20	On the Beaver Division,	6	168	16	224							23	72
Hollidaysburg, July 29.	On the Allegheny Portage, from near the summit of the mountain to the basin at Hollidaysburg,							10	155				
	On the Frankstown line of the Juniata Division,					3	43					13	183
Williamsport, August 24.	On the Lycoming line of the West Branch Division,	3	00	3	00							5	00
Franklin, October 7.	On the French Creek Division,	1	52	4	00							5	52
Beaver, October 19.	On the Beaver Division,	1	168									1	168
		89	34	63	247	3	251½	77	259	32	160	266	311½

Whole distance in miles of canal, towing path, feeders, road formation and laying rails, including the necessary mechanical work, let under the act of 21st of March, 1831, 266 311½

No. 2. A Table of New Work that has been and is yet to put under Contract under the act of the 21st March, 1831.

DIVISIONS AND LINES.	Number of miles of navigation.			Number of miles of rail road.				Estimate.	Amount of work done, amount paid, and amount of per centage retained.		
	Canal under contract.	Slack water under contract.	Feeders under contract.	Road bed formation under contract.	Laying rails. Single track under contract.	Single track not yet under contract.	Double track not yet under contract.	Present estimated cost of work.	Amount of work done.	Amount paid to contractors.	Amount of retained per centage.
	M. P.	M. P.	M. P.	M. P.	M. P.	M. P.	M. P.				
Columbia and Philadelphia rail-road,				41 38	32 160			805,309 26½	230,977 12½	201,558 26	29,418 86½
do. do. work yet to be contracted for, including the cost of all the iron for the whole road,						33 160	49 1	1,151,047 20			
Columbia line of the Eastern Division,	8 227							133,804 52	41,686 63	35 575 94	6,110 69
Frankstown line of the Juciata Division,	22 156	15 266	3 48					698,181 56	84,440 15	72,255 48	12,184 67
Allegheny portage rail-road,				36 221				617,505 98	75,195 76	63,984 4	11,211 12
do. do. work yet to be put under contract,							36 226	654,212 20			
Wyoming line of the North Branch Division,	13 11	3 305	203½					220,594 56	26,447 32	22,454 54	3,992 77½
Lycoming line of the West Branch Division,	31 12	10 56						500,587 54	59,117 39	50,746 88	8,370 51
Lewisburg side cut,	200							22,900 00	1,250 00	1,060 00	190 00
Franklin line of the French Creek Division,	5 52	17 36						270,681 32	17,838 68½	15,136 60	2,702 08½
Beaver Division,	8 16	16 224						385,317 82	42,708 96½	36,360 71½	6,348 25½
	89 34	63 247	3 251½	77 259	32 160	32 160	85 232	5,412,242 66½	579,662 22½	499,133 25½	80,528 97

By the table marked No. 2, it appears that the aggregate of the present estimates for completing the whole work required by the act of the 21st of March, 1831, amounts to 5,412,242 66½

From which deduct the amount of work done and paid at the last monthly estimates, 499,133 25½

4,913,109 41½

Of this quantity of work there has been done but not yet paid, 80,528 97

Whole amount of work yet to be done, 4,832,580 44½

The whole amount received by the treasurer of the Board since the last Report, for canal purposes, and up to the 1st of December, is 2,087,922,16

To which sum add the balances refunded, 4,780,21

$2,092,702,37

Of which sum of $2,092,702,37 the sum of $235,933,34 was received prior to the passage of the act of the 21st March, and of which there was advanced before that day,

On account of old work and damages,	214,704.44	
On account of repairs,	$6,249,32	
To the Canal Commissioners,	3,500,00	
The balance was received since the 21st of March last, and advanced as follows:		
On account of old work,	700,485,58	
do. new work,	610,879,73	
do. repairs,	291,870,32	
do. damages,	22,729,00	
To the Canal Commissioners and appraisers,	4,615,00	
Due Abner Lacock,	141,92	
Balance in the hands of the treasurer on the 1st December, 1831,	207,527,07	
		2,092,702,38

Of the sums advanced as above stated, the sum of $249,449,88 was in the hands of the several superintendents and supervisors on the 1st of December, the greater portion of which sum has been expended, and the accounts are in a train for settlement.

The sum advanced to superintendents on account of new work, 610,879,73

From which deduct amount paid, as above stated, 499,133,25½

Balance in the hands of the superintendents, $111,746,47½

Brought forward,	$111,746 47
Amount in the hands of the treasurer, as above stated.	207,527,07
Balance of the loan authorised by the act of the 21st March last,	789,897,16
Balance of the appropriation of the last year,	1,109,170,70¾
Amount yet to be paid upon the work authorised by the act of the 21st of March last, as above stated,	4,913,109,41¼
Deduct the above balance of last years appropriation,	1,109,170,70¾
	$3,803,938,70½

Which sum of $3 803 938.70½ is the estimated sum yet required to finish the whole work authorised by the act of the 21st of March last.

It may be proper here to remark, that the cost of the work yet to be done has been estimated at the contract prices, with a liberal per centage added to cover contingencies; and although estimates have heretofore proved little else than their own fallacy, yet the board believe the above is ample and may be relied upon.

Having presented the general operations of the board, under the act of the 21st March, 1831, they will now proceed to detail the progress made in the work and its character, on each of the lines separately.

COLUMBIA AND PHILADELPHIA RAIL-ROAD.

As stated above, 39 miles and 248 perches of road bed formation, and the laying a single track of rails on 20 miles of the road next to Philadelphia, were placed under contract on the 11th of May last. In the 39 miles, 248 perches of road bed formation, is included the distance between the western shore of the river Schuylkill and the intersection of Vine and Broad streets; and previous to the allotment of the work, the mayor, aldermen, and citizens of Philadelphia, by their proper authorities, engaged to construct and continue a rail-road, from the intersection of Vine and Broad streets down Broad street to Cedar street, agreeably to the provisions of the first section of the act of the 21st of March last. On the 18th of May, one mile and 110 perches of road bed formation, and the laying of a single track of rails on 12½ miles next to Columbia, were put under contract.

The amount of work done is $230,977 12½, of which there has been paid $201,558 26; leaving retained percentage $29,418 86½.

The quantity of work done falls short of the wishes of the board; not from any want of zeal or diligence in the officers or a majority of the contractors on the line, but owing to an uncommon wet season, a scarcity of laborers and consequent rise of wages, under estimates by contractors at the lettings, and to the

difficulty of part of the work, and, as a necessary result, to an abandonment of a great many contracts. The board have especially to notice the effect of these causes of delay, upon the viaduct over the river Schuylkill, at Peters' Island. This structure is calculated to be a road bridge for travel, as well as for passing the rail-road cars; it will be 980 feet long. It was let to William & Charles Le Baron and Gabriel Hiester, on the 14th day of May. These men were the lowest bidders, and no doubt was entertained by the board of the sufficiency of either their skill or capital for the undertaking; but on the 8th of June the board were advised that they had declined signing the contract. It was immediately advertised for re-letting. To the time required by law for advertising, to give an opportunity for suitable bidders to get notice, and to the absence of the board, attending to duties required of them in other and distant places, and to the sickness of the late president of the board, to whom the proposals were transmitted by the superintendent, is to be attributed the apparent delay which took place in re-letting this important work. It was not, therefore, until the 3d day of August, that it was re-let to Lathrop, Ives and Brown, who were the lowest bidders, and some of whom the board knew to possess the requisite skill and capital. But here, again, the board and the public were disappointed in their expectations, for the latter contractors also relinquished the job. The viaduct was again let on the 1st of September, to Dodd, Bishop and Brittain, bidders at the re letting, who have entered into a contract, and have since been prosecuting the work as vigorously as the advanced season and other circumstances would permit. It is thought that it may be completed for public use by the first day of December next.

The board have in like manner been frustrated in their calculations, by some of the contractors for laying rails, abandoning their contracts. The difficulty of procuring stone blocks of a suitable quality, has proved to be much more serious than was at first anticipated, and the consequence has been a retarding of the work, and an increase of its cost over former estimates. The present estimate of the cost of the whole work, when completed, is $2,297,120 21, being equal to $28,173 63 per mile.

The work is constructing upon the principles of the latest improvements in rail-roads, and in the most substantial manner; and although the cost of it may appear to be large, yet, when the quality of the work, and the sum required to construct similar works elsewhere are duly considered, it is perhaps as reasonable as ought to have been expected. The graduation and masonry alone, of the first twelve miles of the Baltimore and Ohio rail-road, cost $46,354 $\frac{56}{100}$ per mile; and that whole road, now under contract, (being 71 miles upon the main stem of the road with *double tracks*, and a branch of 8½ miles to Frederick with a *single track*, one third of the whole road to be laid with stone rails, and the remaining two thirds with wood,) is estimated to cost

$1,906,853, or $27,228 per mile. The company, in their late report, state "that it required 6¼ months to lay down 6 miles of stone track," and "that the cost of laying with stone has been underrated in every instance." The celebrated Liverpool and Manchester rail-road, in England, which has been the principal cause of creating an excitement in public opinion favorable to that species of improvement, cost the enormous sum of 117,000 dollars per mile.

While the board avow themselves favorable to rail-roads where it is impracticable to construct canals, or under some peculiar circumstances, yet they cannot forbear expressing their opinion, that the advocates of rail-roads generally, have greatly over-rated their comparative value. To counteract the wild speculations of visionary men, and to allay the honest fears and prejudices of many of our citizens, who have been induced to believe that rail-roads are better than canals, and consequently that, for the last six years, the efforts of our state to achieve a mighty improvement have been misdirected, the canal commissioners deem it to be their duty to advert to a few facts which will exhibit the comparative value of the two modes of improvement for the purpose of carrying heavy articles cheaply to market, in a distinct point of view.

Flour is now carried by the canals to Philadelphia from Lewistown, 211 miles for 62½ cents, and from Harrisburg, 150 miles for 40 cents a barrel; and gypsum is taken back for three dollars a ton to Harrisburg and five dollars a ton to Lewistown, therefore the freight (exclusive of tolls) is downwards 14¼ mills per ton per mile, and returning, 7 mills per ton per mile; or on an average both ways one cent and three-fourths of a mill per ton per mile for carriage.

On 9 miles of rail road at Mauch Chunk, and on ten miles of rail road between Tuscarora and Port Carbon, the carriage of coal costs 4 cents, and the toll on the latter road is a cent and a half per ton per mile.

The comparison will then stand thus:

On ten miles of rail road between Tuscarora and Port Carbon:

Freight per ton,	40 cents	
Toll on coal per ton,	15	
	—	55 cents.
On ten miles of the Pennsylvania canal:		
Freight per ton,	10¾	
Toll on coal at half a cent per ton per mile,	5	
	—	15¾
		39¼

Being 39¼ cents difference in favor of the state canal on each ton for every ten miles of transportation.

The following table will exhibit the relative useful effects of horse power when employed on common roads, on turnpike roads, on rail roads, and on canals.

Four horses will draw, in addition to the weight of the carriage or boats containing the load,	Weight of Freight transp'rtd	Number of miles per day.
On a common road, in a wagon,	1 Tcn.	12 Miles.
On a turnpike road not exceeding five degrees of inclination, in a wagon,	1½ "	18 "
On a rail road having a rise and fall of 30 feet, (or one third of a degree) to the mile, in eight cars,	16 "	27 "
On the Pennsylvania canal, in two boats,	100 "	24 "

The introduction of locomotive engines and Winans cars upon rail roads, where they can be used to advantage, will diminish the difference between canals and rail roads in the expense of transportation. But the board believe that, notwithstanding all the improvements which have been made in rail roads and locomotives, it will be found that canals are from two to two and an half times better than rail roads for the purposes required of them by Pennsylvania.

The board have been thus explicit, with a view to vindicate the sound policy of the commonwealth in the construction of her canals; yet they again repeat that their remarks flow from no hostility to rail roads, for next to canals, they are the best means that have been devised to cheapen transportation. They are valuable in many situations, and particularly along courses of great thoroughfare, which will bear the expenses of their construction. They can be made to carry the United States mails and passengers, and also light valuable goods, where *time* is of more importance than cost of transportation.

It is expected that of the Columbia and Philadelphia rail road 17 miles of single track, from the Schuylkill westward, and 12¼ miles from Columbia eastward, will be laid by the first day of May next, and may be extended over the whole line by the first day of December next, and that the entire work can be completed in two years.

THE COLUMBIA LINE OF THE EASTERN DIVISION.

The 8 miles 227 perches of canal necessary to complete this line, were placed under contract on the 18th of May last; but owing to the causes already mentioned, and a great degree of sickness which prevailed during the months of August and September, the work done upon it on the 15th November, 1831, amounted only to $41,992 03, of which 35,575 94 has been paid, and 6,110,-69 is retained. The prominent works upon this part of the line are, an aqueduct over the Swatara 300 feet long and 18 feet wide, with a road bridge attached to it—two out-let locks of ten feet lift each, and 100 by 17½ feet in the chambers, to connect the basin

at Columbia with the river Susquehanna—and two lift locks overcoming a fall of 16 feet.

The entire work authorised to be put under contract on this line under the act of the 21st of March last, when completed, is now estimated to cost $133,804 52; (the out-let locks were not included in the estimate of last year,) and the estimate of the cost of finishing the work upon the 10 miles of this line, placed under contract before the 21st of March last, is $23,718 02.

It is expected that the work upon this line will be so far completed, as that the water may be admitted in June next.

FRANKSTOWN LINE OF THE JUNIATA DIVISION.

This line is 38 miles and 102 perches in length, of which 22 miles and 156 perches will be canal, and 15 miles 266 perches slackwater, made by 14 dams in the river. It extends from a point one third of a mile above Huntingdon to Hollidaysburg, where a basin 1630 feet long and 120 feet wide has been located, and at which place a connexion is established with the Allegheny portage road. Two feeders will supply the first level—a dam will be built in the Beaver dam branch at Hollidaysburg, and the pool of the dam, which is crossed by the rail road, will also answer for a basin—it will be 850 feet in length and 100 feet wide. The two basins are connected by a short feeder canal 36 perches long, being of the same dimensions as the canal; another feeder is taken from the south fork of the Juniata—it is 3 miles and 48 perches long, and 10 feet wide at the bottom. On this line there are 14 dams, varying from 5 to 27½ feet in height—6 aqueducts; 6 towing path bridges, crossing the river; 8 guard, and 43 lift locks, overcoming a rise of 330½ feet.

The work upon the Frankstown line was placed under contract on the 1st of June, and on the 29th July last. The causes which have retarded the progress of the work upon all the lines, operated with peculiar force on the Juniata, compelling many of the contractors to relinquish their jobs, and thus producing a delay of the work by the necessity of advertising it for re-letting, and procuring the sanction of the canal commissioners to new contracts.

The work upon this line, when completed, is at present estimated to cost $698,181 56. The amount of work done, on the 25th day of November, was $84,440 15; of which there has been paid $72,255 48, and $12,184 67 is retained. It is believed that if the ensuing season is favorable, this line will be ready for navigation throughout, by the 1st day of October next.

ALLEGHENY PORTAGE RAIL-ROAD.

The length of rail-road, from the east end of the lower basin at Hollidaysburg, to the west end of the basin at Johnstown, is 36 miles and 221 perches; but between the head of the basin at Johnstown, and the upper basin at Hollidaysburg, the distance is

only 35 miles and 310 perches. The summit of the mountain, where the rail-road crosses it, is 1398$\frac{11}{100}$ feet above the eastern, and 1171$\frac{88}{100}$ feet above the western basin. Connexions will be formed between the rail-road and canal, by piers and slips, at both ends of each basin. These piers and slips have been set apart for the use of the commonwealth, and will occupy the whole ground, (about 100 feet wide) between the basins and the rail-road, for 150 feet in length at the west end, and 200 feet at the east end of each basin.

A space one hundred and twenty feet wide, has been staked out and appropriated to the use of the commonwealth, the entire length of the rail-road. The reasons which governed the board in occupying so much ground, are these: It was necessary to clear off the tall heavy timber of the mountain, for at least 60 feet on each side of the centre of the road, and hereafter the incalculable trade of the Mississippi basin and the lakes, will require an additional number of tracks over the mountain; hence, prudence seemed to dictate the propriety of appropriating to the use of the state, as much ground as may hereafter be required, while it is, as at present, of very little value.

The bed of the road is graded 25 feet wide, for a double set of tracks. There will be five inclined planes on each side of the mountain, intended for stationary engines, as soon as the quantity of trade passing over the road shall require so much power. Horse power, however, can be used in the commencement, as the inclination of none of the planes is greater than many portions of our turnpike roads, the greatest angle of inclination with the horizon being only 5 degrees, 51 minutes and 9 seconds. But inasmuch as the trade from the west will greatly overbalance that from the east, and the bituminous coal at and near the summit of the mountain can be used to equalize the necessary preponderance, it is believed that, on the east side of the mountain, the rise of the planes may be overcome on the self acting principle; thus making gravity the motive power, and thereby dispensing with the use of either horses or steam, on the five eastern planes.

The most important works upon the Allegheny portage, are a tunnel about 19 miles west of the crest of the mountain; it is 900 feet long, and 16 feet wide; a viaduct of stone with a single arch of 80 feet span over the Little Conemaugh; and also one of wood, of two spans of 33 feet each, over the Beaver dam branch of the Juniata.

The rail-road when completed with a double set of tracks of stone and iron with the necessary machinery, the whole executed in the best manner, is at present estimated to cost $1,271,718 18. The amount of work done on the 1st day of November was $75,195 96 of which $63,984 84 has been paid, and $11,211 12 is retained. The Board are of the opinion that one set of tracks can be laid along the whole line for public use, by the 1st day of May, 1833, and that the entire work can be completed by the 1st day of December, 1833.

THE BEAVER DIVISION

Commences on the Ohio river at the mouth of Big Beaver, and extends up the Beaver and Shenango creeks 24¾ miles to the town of Newcastle. Of this division there are 8 miles 16 perches of canal, and 16 miles and 224 perches of slackwater and towing path. The contracts on it were let on the 20th of July, and 19th of October last. There are on it 7 dams varying from 7 to 14 feet in height, 2 aqueducts, and 17 guard and lift locks overcoming a rise of 132 feet. The two outlet locks will each be 25 feet wide, and 120 feet long within the chambers. They are calculated to admit the smaller class of steam boats that ply on the Ohio, into the pool of the first dam. This was found to be necessary for the trade of the town of Beaver, as well as for several flourishing villages, situated on the banks and near the mouth of the creek, and also to accommodate a number of extensive manufactories, the machinery of which is propelled by water taken from the falls of that stream.

The Beaver division, when finished, is at present estimated to cost $335,317 82. The amount of work done on the 15th day of November, was $42,708 96¼, of which $36,360 71¾ has been paid, and $6,348 25¼ is retained. The whole line is expected to be completed for public use by the 1st day of December next.

FRANKLIN LINE,

Of the French creek division commences on the Allegheny river, at the mouth of French creek, and extends up the latter stream 22 miles and 88 perches, to its intersection with the feeder. On this line there are 5 miles and 52 perches of canal, and 17 miles and 36 perches slackwater and towing path. The principal works are 11 dams, varying from 7 to 16 feet in height, and 3 guard and 16 lift locks, which overcome a rise of 120½ feet. The work was put under contract on the 11th of July, and 7th of October last.

The whole cost of the line, when completed, is at present estimated at $270,681 32. The amount of work done on the 16th day of November, was $17,838 68¼, of which $15,136 60 has been paid, and $2,702 08¼ is retained.

This line may be completed and ready for public use by the 15th of November next.

The board would here respectfully call the attention of the legislature to the situation of the French creek feeder—It has been finished a distance of 19½ miles ready for use, but at neither end is it connected with water or any public place of business, and in its present condition is entirely useless. An extension of it at the north end, of about 160 perches, would connect it with French creek, and fill it with water and render it useful. It has been estimated by the engineer now upon that division, that $15,000 would be required to form the necessary connexion. This extension of the feeder is indispensable for opening a communication between Meadville and the Allegheny river. The board also re-

commend it's extension at the western end, three miles, to connect it with Conneaut lake, thereby adding 18 miles between French creek and the head of the lake, to the useful navigation of that division. The cost of this latter extension is estimated at $26,000.

LYCOMING LINE,

Of the West Branch division commences at the head of the pool of the Muncy dam, and from thence extends up the West Branch of the Susquehanna river, 41 miles and 68 perches to the Big island opposite to the mouth of Bald Eagle. On this line there are 31 miles and 12 perches of canal; 10 miles and 56 perches of slack water and towing path; 7 dams, varying from 4 to 10 feet in height; 4 aqueducts and 12 guard and lift locks, which overcome a rise of 80 feet. The work was put under contract on the 1st of July and 24th of August last. The whole cost of the line when completed, is at present estimated at $500,587 54. The amount of work done on the 25th day of November was $59,117 39, of which $50,746 88, has been paid, and $8,370 51 is retained. This line may be finished by the 1st day of December next.

Although the West Branch division will be valuable to portions of the counties of Northumberland, Union, Centre, Clearfield, M'Kean, Potter, Tioga and Lycoming, to convey away the products of the farm and the forest, and in return carry back the necessary supplies of merchandize, &c. from the sea board; yet, we apprehend that it will be to the iron and bituminous coal of that region, that the commonwealth must look for tonnage sufficient to compensate her for the investment she has made in this branch of the canal. Therefore to attain this great object and enable the West Branch division to sustain itself, it will be necessary to extend the improvement further up the river to the neighborhood of the coal beds; and also by a cross cut to open a communication with the Bald Eagle, so as to give the iron and produce of Centre county, ready access to the canal.

The engineer upon the upper portion of the Lycoming line has estimated that $18,172 00 will be sufficient to construct a cross cut of 3 miles and 132 perches, between the pool of the dam at the Great island and Bald Eagle creek, with a dam 4 feet high, and a guard lock on the creek; and also an out-let lock of 9 feet lift to communicate with the river. He has likewise estimated that one other dam in the river, and a guard lock with 4 feet lift to it, and 5 miles and 45 chains of towing path, with other necessary works, will cost $86,547, which extension would carry the improvement to the threshold of the coal region. But, to render the improvement entirely useful by an approximation to numerous coal beds on both sides of the river, a further sum of $62,893 would be required, to build three other dams, and as many guard locks, each having 4 feet lift; and also 3 miles and 156 perches of towing path; thus estimating the whole proposed improvement of 9 miles and 51 perches to cost $99,440 00.

LEWISBURG CROSS CUT.

This small prong of the great system, extends two hundred perches from the main stem of the West Branch division, to Lewisburg, in Union county. There will be on it 1 dam 2¼ feet high, across the river, and 2 locks, overcoming a lockage of 21 feet. A contract was made on the 17th day of August last, for the completion of the whole work connected with the cross cut, for the sum of $22,000, being $3000 less than the sum appropriated to that object by the act of the 21st of March, 1831. The estimate of work done on the 25th of November, was $1250, of which the sum of $1060 has been paid, and $190 is retained.

The whole work may be completed for public use by the first day of September next.

THE WYOMING LINE

Of the North Branch division, commences at the Nanticoke dam, and extends up the North Branch 16 miles and 316 perches, to a point near the mouth of the Lackawannock creek, where it is supplied with water by a feeder from the creek, 203½ perches in length. There are 13 miles and 11 perches of canal, and 3 miles and 303 perches of slackwater and towing path. The most important mechanical work upon this line, is one aqueduct and 5 lift-locks. The whole lockage is 43 feet. The work upon this line was put under contract on the 18th of June last, and, when completed, is estimated to cost $220,594 56. The amount of work estimated to have been done on the 25th November, was $26 447 32, of which the sum of $22,454 54 has been paid, and $3,992 77¾ is retained. It is expected that this line may be completed by the 1st day of August, 1832.

Previous to fixing the location of the Wyoming line, the board caused careful surveys to be made in and on both sides of the North Branch, which resulted in establishing an independent canal on the east or Wilkesbarre side of the river. In consequence of this location, the citizens of Kingston, with a rich valley, several flouring mills and valuable coal beds, are deprived of the full benefit of the improvement. It has been suggested that a short side cut, and an outlet lock into the river at Forty Fort, would be a great advantage to those interests. Believing, as the board do, that the additional tonnage would amply justify the expense of the proposed side cut, they therefore do not hesitate to recommend to the legislature its adoption.

The whole amount of work, authorized by the act of the 21st of March, 1831, which has been put under contract is estimated to cost $3,603,983 26¼. The aggregate of the estimates of work done, made principally on the 1st, 15th, and 25th of November, is $579,662 22¼ of which $499,135 25¼ has been paid, and $80,528 97 is retained from the contractors, as security for the faithful performance of their engagements.

That more work has not been performed, during the past season is attributable to the time required to organize efficient corps of engineers, and for them to make the necessary plans and locations previous to the lettings; to a scarcity of laborers, caused by the general prosperity of the country, and the great amount of work in market in Pennsylvania, and throughout the United States; to an uncommonly wet, and (on many of the lines east of the mountains) sickly season, and to numerous abandonments of contracts.

Although the quantity of work done falls short of the previous expectations of the board, yet they have the satisfaction to state, and they do it with great confidence, that *what has been done is well done.* The qualifications of the engineers now in the service of the state, and the style of the work that is being done under their plans and directions are greatly superior to either the one or the other at the commencement of the canal and rail road system of Pennsylvania. The contracts are full and explicit, and the board believe that on all the lines they are literally interpreted and their conditions rigidly enforced. Nothing has been left to discretion or construction that was susceptible of specification; and all sub-contracting by canal and rail road speculations is banished from the public works.

The work authorised by the act of the 21st of March last, which has been placed under contract, is estimated at $3,603,983 26; and the work yet to be put under contract is computed to cost $1,808,259 40. The present condition and progress of the work induces the board to believe, that the balance of the appropriation now available will be exhausted on some of the lines by the middle of next January, and on all of them within the month of April next.

In addition to the unexpended balance of the appropriation made by the act of the 21st of March, 1831, it is estimated, that during the ensuing year there will be required about $70,000 for paying off contracts on the old lines, and $1,995,679 30 for the lines of canal and rail road which have been placed under contract the past season, being the estimated balance required for the completion of the work now under contract; and also $800,000 for the contracts yet to be entered into—making an aggregate sum of $2,865,679 30 that will be wanted for the expenditures of the next year.

OLD LINES OF CANAL.

THE DELAWARE DIVISION from Bristol to Easton is 59¾ miles. At the last annual report of the Canal Commissioners, December 21, 1830, in speaking of this division they say that, "the filling of the canal for navigation in its whole course, commenced in October 1830" and that, "twenty-five miles are navigable," but they add that "a part of the work first constructed has proved defective and requires extensive repairs." This last observation has been verified by the fact that since that time, the two Supervisors on the Delaware division have expended $97,339 51 on re-

pairs, and in introducing feeders, and the whole line is not yet ready for navigation. The original plan and construction of large portions of this division have proved to be exceedingly defective, and, although every exertion has been made throughout the year, by the officers on the line, to fill the whole canal with water, yet their efforts have heretofore proved unsuccessful.

The twenty five miles of canal between New Hope and Bristol, was open for navigation on the 20th of last March; and has continued in good order, throughout the season, with but two or three weeks interruption, caused by the falling of the water in the river from which it was supplied: but for want of a connexion with the upper portion of the canal, this part of it has been almost useless. The water from the head of the canal at Easton, has within a short period reached New Hope, and confident expectations are entertained that the whole line will yet be filled, ready for an active navigation next season.

The porous nature of the soil along the Delaware, has demonstrated the fallacy of the original design, of feeding the entire 60 miles of canal from the Lehigh Hence it has been found necessary to introduce other feeders: One for conveying into the canal, the waters of Durham creek, about ten miles below Easton; it is 1890 feet long, and 12 feet wide at the bottom; and another near Lumberville, by which the water of Milton creek is conv into the canal, it is 1509 feet long. Temporary feeders have also been constructed on sections 54 and 61, which will not be required when the repairs of the canal are completed.

The want of a sufficient supply of water at the lowest stage of the river, had become so apparent to the board, that at their session in Philadelphia, on the 6th of May last, they passed the following resolution:

"Resolved, That the supervisor having charge of the lower portion of the Delaware division be required, under the direction of the principal assistant engineer, to construct a wing dam at Wells' falls, on the Delaware river, in such manner as not to obstruct the navigation of the river, and erect a water wheel with such other fixtures as may be necessary to supply the canal with water from the combined locks, near New Hope to Bristol."

In passing the foregoing resolution, the board expressly disavow any intention on their part, of impeding the natural navigation of the river; or of infringing the compact between the states of New Jersey and Pennsylvania. But inasmuch as the former state had by law, granted power to the Delaware and Raritan canal company to take water from the river Delaware, by a navigable feeder, to supply the summit level of their great canal; and had also authorised another company to construct, and fill with water from the river, a wide canal, six miles long, for propelling machinery at Trenton, the board conceived that the state of New Jersey had, thereby, given such a construction to the compact, as would justify Pennsylvania in erecting a water wheel to supply a portion of

her canal. That work is now in such progress as to ensure an ample supply of water hereafter, between New Hope and Bristol.

While it has become the duty of the board, in justice to the public, as well as to themselves, to expose the defects in the construction of the Delaware division; and also the errors that have been committed on other lines: they likewise feel it to be incumbent on them, to declare their belief that the source of the evil, is not to be sought in any want of zeal, or faithfulness on the part of their predecessors in office, but in the law passed the 16th of April, 1827, which limited the pay of engineers.

Engineers, like all other men who seek employment, will generally be found where their talents are best appreciated, and hence it should not have been expected, that those who were in the receipt of from three to five thousand dollars a year, would enlist in the service of Pennsylvania at the limited salary she offered.

The former board of canal commissioners, in their repo t of the 25th of December, 1827, complain of the effects of that law by stating, that they were "suddenly deprived of the most valuable assistance," and "could not but entertain a painful sense of the responsibility of their situation, and of the consequences that might arise from any error on their part." And they also add, that "it is believed that the organization of the engineer department, upon a regular and well digested system, is necessary to ensure economy of expenditure and excellence of construction. This object," say they, "has not yet been accomplished, nor is it believed to be practicable, while the provisions of the act of the 16th of April, 1827, continue in force."

The present board do not wish to be understood, as finding fault with the law as it now stands; for the increase of engineers in the United States has enabled them to surmount the difficulties complained of by their predecessors: But the effects of that misjudged economy have been seriously felt by th s board in the difficulty of putting the canal in navigable order—by the public, in being subjected to vexatious delays, and by the commonwealth in the cost of construction and of repairs, and the loss of interest on the money expended.

THE NORTH BRANCH DIVISION, from Nanticoke dam to Northumberland, is 55¼ miles. Although this division was reported as finished last fall; yet it was not until the 27th of September that the supervisors of the line succeeded in passing boats the whole distance over it. Since then, the navigation has been uninterrupted, and boats have arrived at Wilkesbarre, direct from Philadelphia, a distance of 216 miles. The chute in the Nanticoke dam has been altered, and constructed in such a manner as, it is believed, will afford entire safety to the descending trade of the river. $55,752 56¾ have been expended in repairs, &c. since the 1st of December, 1830.

MUNCY LINE OF THE WEST BRANCH DIVISION, from the head of the pool of Muncy dam to Northumberland is 24½ miles.

This division was reported navigable in November, 1830; but the unusual floods of the past season, undermined the Muncy dam, and it had to be rebuilt; which has been effected in water that was from 15 to 23 feet deep, (being the excavation made by the overfall of the dam) and under great embarrassments, from a succession of freshets in the river. It is now being completed, and is so well executed as to give entire confidence in its future permanency. Hence there has, as yet, been but little navigation on this line.

The bridge over the West Branch of the Susquehanna, at the town of Northumberland, was finished about the 21st of May, 1831, from which time, to the 24th of November, the amount of tolls received on it has been $740 50.

The expenditures upon the line, since the 10th of December, 1830, for repairs, &c. (including the amount paid on the new dam) have been $20,095 96½.

THE SUSQUEHANNA DIVISION, from Northumberland to the south end of Duncan's Island, is 39 miles. The navigation upon this division was closed by ice on the 10th of January, 1831, and re-opened on the 25th of March last. The trade upon it has suffered very little interruption during the past season, except for a short period, owing to a want of water, caused by a failure of the Shamokin dam.

The board avail themselves of the present occasion, to record their decided disapprobation of having high dams in the Susquehanna river. Had low dams been originally adopted, it would have avoided the immense expense, risk, loss and vexation, which have been consequent upon these great and unstable structures. The Shamokin dam is 9½ feet high above the bottom of the river, and 2783 feet long; and the chute in it is 62 feet wide, and, as now extended, is 650 feet long. This "hopeful structure" has been twice built; and as often unfaithfully executed! A want of skill or vigilance in the officers superintending the construction, and of integrity in the contractors, is too manifest to be palliated.

On the 21st December, 1830, the dam and chute had cost $64,217$\frac{77}{100}$; and the repairs that have been done and are being done upon it this season, will add about $18,000 to the cost.

A large amount of property was lost and injured in descending the chute last spring, and the ice removed about 180 feet of the dam, and materially damaged other portions of it. It has been undergoing a course of alterations and repairs: but the first contractors for repairing the dam abandoned the job, and the work had to be re-let, which, with the continued high water of the river, has delayed its completion. The chute is finished, and, is believed, will hereafter render the passage of the descending trade of the river perfectly safe and easy. The repairs of the dam are nearly completed, but truth requires the board to state their opinion that its permanency is still insecure.

The amount expended since the 10th of December, 1830, on this division from Northumberland to the first lock below Berry's

Falls, for repairs, &c. (including the Shamokin dam and chute,) has been $17,564 86.

THE HARRISBURG LINE OF THE EASTERN DIVISION from Duncan's island to the Swatara is 24 miles. The navigation of this line was not suspended by ice until the 10th of January, 1831, and the canal opened again on the 22d of March; since which time it has continued in good order the whole season. This short line has given an earnest of what may be expected from all the others, when they shall have been effectually repaired.

The bridge over the river Susquehanna at Duncan's Island is built on the Lattice principle. The final estimate of the cost amounted to $74,853 30, of which $72,854 85 have been paid, the balance amounting to $2,000 45, is retained, as the work is proved to have been very unfaithfully executed. The board passed a resolution on the 28th of December, 1830, directing it to be repaired, and a contract was soon afterwards executed; but about the 24th of August, the contractors relinquished the job, having done very little towards the fulfilment of their engagement. The bridge is now being repaired by the supervisor upon the line, in such a manner as will, it is believed, remedy many of its original defects, and render it safe and durable.

The repairs on this line, including ten miles of the Susquehanna division, since the 10th day of December, 1830, amount to $9,324-12½.

THE JUNIATA DIVISION, from Duncan's Island to Huntingdon, is 89 miles. The canal as far up as Lewistown, being the lower half of this line, kept open for navigation until the 10th January, 1831; and the navigation was opened on the 25th of March, to Newton Hamilton, which is 69 miles above Duncan's Island.

One of the abutments of the dam in the Long Narrows was injured, and the towing path of the canal for some distance below it, was broken through in several places by an unusual freshet in the spring.

About the 25th of April, the two aqueducts over the river at Shaver's ford and at Jack's narrows were finished, and shortly afterwards boats arrived at Huntingdon from Philadelphia, a distance of 235 miles. Since that time the navigation has been uninterrupted, except for a few weeks; which was occasioned by the breach of a large culvert near Waynesburg, and the sinking of one branch of the dam at North's island, which had been undermined by the overfall of the water. The culvert was rebuilt with great promptitude, and both the dams have been repaired. The towing path through the long narrows, has been raised and strengthened; and water ways have been constructed round the locks: so that when a few other repairs are made which are yet necessary, and which can be done during the ensuing winter, the whole line will be in good order for an active trade between the east and the west, next season.

The expenditures for repairs, &c. on the 89 miles, since the 1st of December, 1830, have been $66,976 55½.

THE WESTERN DIVISION, from Johnstown to the Monongahela river, at Pittsburg, and including the branch and out-let locks into the Allegheny river, is 105 miles. The canal from Blairsville to Pittsburg, continued open for navigation until the 11th of January, 1831; and the trade commenced again upon the whole division on the 7th of April last.

The tunnel at Pittsburg and out-let locks into the Monongahela, are finished ready for navigation. This tunnel is solidly arched throughout with sand stone, laid in hammer-dressed range work.

The tunnel that was excavated through a hill at a loop of the Conemaugh, about ten miles below Blairsville, has given much trouble, by the rock falling from its roof. Hopes were entertained that as soon as the roof would acquire the form of a gothic arch, it might become permanent; but these hopes were disappointed. Large masses of stone continued falling, which often interrupted the navigation, and rendered a passage through the tunnel extremely dangerous. The board, therefore, gave directions to have so much of it arched as had manifested symptoms of giving way. The largest portion of the work has been done, and the most dangerous places have been secured. The residue of the arching will be finished during the ensuing winter.

Dam No. 4, at the tunnel, required extensive repairs, which have been made, and they are done in a substantial manner.

The whole western division was kept in good navigable order, until the 7th of July last, when the greatest disaster happened that has heretofore befallen the public works of the state. Continued wet weather, for several weeks prior to the 7th July, had saturated the ground, and filled the streams with water, when an unprecedented rain fell upon a narrow strip of country parallel with the Conemaugh, and only a few miles distant from it, which in four or five hours, swelled the small tributary streams on the south side of the river into irresistible torrents, which, in their headlong course, swept off fences, bridges, mill dams, saw mills, and houses, and suddenly raised the river to an extraordinary height.

At the mouth of Tub Mill creek, there were about 14,000 yards of embankment, and a great amount of protection wall carried away from the canal. M'Gee's run bore off a towing path bridge. Stony run swept away the aqueduct over it, and several small towing path bridges, walls and embankments, along the Kiskiminetas line, were thrown down, carried away, or destroyed. But the most serious effect produced by the flood, was the destruction of a large dam over the river at Leechburg.

Immediate measures were taken to repair the injuries sustained by the public works, and proposals were received from contractors for repairing the old dam, and also for building a new one, 1400

feet further down the stream. Upon opening the proposals, and calculating the value of the bids, it appeared that about as much was asked for repairing the old dam, (when taken in connexion with the abutments and the guard lock which required to be re-built) as for building a new dam and all things connected with it; hence the board decided upon having a new dam erected.

The reasons which governed the board in their decision, were, the extent of the breach in the old dam, and that the foundation was washed out to a great depth; that the old dam was grossly defective both in plan and construction, and a portion of what was yet standing was greatly shattered; that the same cause which had effected the present breach might again occur, and remove the remainder of the dam, at a time when an immensely increased commerce would proportionably magnify the evil; that one of the abutments required immediate re-building, and that the other one, being constructed of wood, must soon perish; that the guard lock was so unfaithfully executed, as also soon to require re-building; that the site chosen for the new dam afforded rock for one of the abutments; that the principle upon which the new dam was proposed to be constructed, afforded entire confidence in its strength and stability; and lastly, that very little, if any, saving would be effected, either in time or expense, by adopting a temporary patch work plan, instead of a radical remedy.

The new dam has a base of 96 feet with the thread of the stream, sloping on both sides to the comb; it is 23 feet high from the bottom of the river, and 23 feet high from low water mark; and has a wier 450 feet long.

The abutment and guard lock were built by contractors, and the dam itself was erected by the three supervisors upon the western division. The board take great pleasure in bearing testimony to the unremitting diligence of those gentlemen, Messrs. Leckey, Knott and Jameson—This great structure was urged forward by them with such system, energy and perseverance as to be completed, (except some gravelling,) in 68 days from the time the first timber was laid down.

All the other injuries sustained by the flood have been effectually repaired, and there is now no obstacle to the future use of the western division.

The whole amount of money expended for repairs, &c. between Johnstown and Pittsburg, including the Leechburg dam and guard lock, since the 10th of December, 1830, is $73,217 61½.

THE FRENCH CREEK FEEDER, from near Bemis' mill to the lower end of the feeder, by Conneaut swamp, is 19¾ miles. The present situation of the feeder renders it entirely useless. $4,399 85 has been expended during the present year in securing the aqueduct over French creek, and in making some other repairs deemed indispensable for the preservation of the canal.

The following is a summary of the old lines of canal with their length, and the sums expended on them for ordinary and extraordinary repairs within the year, and for additional structures to render them more perfect.

	length	Total disbursements		Ordinary repairs		Extra'ry expenses	
	miles	Dolls.	cts.	Dolls.	cts.	Dolls.	cts.
Delaware division,	59¾	97,339	50¾	10,000	00	87,339	50¾
Columbia line of the Eastern division,	10	8,974	04	1,657	74	7,316	30
Harrisburg line, including Susque. to lock at Berry's Falls.	63 00	9,324	12¼	3,108	04	6,216	08¼
Susque. division, from lock at Berry' Falls.		17,564	36	5,854	75	11,709	61
North Branch division,	55½	55,752	56¾	18,584	18¾	37,168	38
West Branch division,	24½	20,095	96½	6,698	65½	13,397	31
Juniata division,	89	66.976	55½	22,325	55½	44,651	00
Western division,	105	73,217	61½	24,405	91½	48,811	70
French Creek feeder,	19½	4.399	85	74	00	4.	25 85
	426¼	353,644	58¼	92,708	84¼	260,935	74

It will be perceived by the above table, that the ordinary repairs on 426¼ miles of canal, have cost $92,708 84, while the extraordinary expenses incurred within the last year have amounted to $260,935 74. This last sum belongs more properly to the cost of construction than the expense of repairs, being principally incurred in making necessary new works, and in remedying the defects of old works, which required large expenditures to render them useful and permanent. The aggregate estimates of the supervisors, for ordinary repairs, &c. within the ensuing year, amount to about $100,000. But as the works have all been recently constructed, it would be unwise to expect a total exemption from partial failures; it will, therefore, be necessary to provide for casualties to which all new works of this kind are subject.

Finding that the appropriation for making repairs on the canal, and for other purposes, would prove inadequate to meet all the demands upon that fund, the board of canal commissioners, on the 11th of November last, directed so much of the fund as was then in the treasury, to be paid to the supervisors having the charge of the Leechburg, Muncy, and Shamokin dams, deeming the completion of these structures of vital importance to the whole canal system. Hence there is a deficiency for other objects, intended to be paid out of that appropriation, some of which are of an urgent nature, requiring the speedy interposition of the legislature.

While the board are not disposed to doubt the wisdom of making specific appropriations for the construction of the several

lines of canal and rail-road, yet they would respectfully suggest the propriety of making a general provision for repairs, that may become necessary. A limited appropriation may often not be adequate to meet extraordinary exigencies, and for want of power in the fiscal officers of the government to grant relief, may be attended with disastrous consequences.

A combination of untoward circumstances, during the past season prevented the use of the greatest part of the canal, and hence the toll received for 11 months, ending on the first of November last, amounted only to the sum of $38,241 20.

A want of correct information, respecting the power and capacity of the canal, and distrust in its stability, caused the usual number of arks to be constructed, which, with a favorable state of water in the rivers throughout the season, conveyed to market the greatest portion of the produce of the country. In May last, the trade between Philadelphia and Pittsburg began to take the route of the Schuylkill, Union and Pennsylvania Canals, and was becoming quite active; when on the 7th of July the disasters, already detailed, took place along the Conemaugh and Kiskiminetas rivers, since which time the trade by that route has been entirely suspended. Full confidence is entertained, that neither of the above causes will operate hereafter, and that in ordinary seasons the public may calculate upon having an uninterrupted navigation, from about the 15th of March, to the 15th of December; or nine months in every year.

From preparations, which are making by the citizens along the several lines, to employ the canal next season, calculations have been made by the collectors, of the probable amount of toll which may be expected during the next year. These estimates amount to $161,000; the board believe it will be safe to place it at $150,000.

The tolls charged on the Pennsylvania canal were revised by the board of canal commissioners, on the 9th of last April; they are now as low as justice can require, or prudence will warrant. A copy of the rates of toll in tabular form marked B, accompanies this report.

Numerous water powers have been, and are being, created by the Commonwealth, along the several divisions of canal and slack water. It is respectfully suggested that an authority vested in the board, to dispose of so much of the surplus water as cannot be required for the purposes of navigation, would multiply manufactories, promote the prosperity of the country, and add much to the revenue of the state in rent, for the use of the water, and in tolls on the additional tonnage arising therefrom.

Under the act of the 6th April, 1830, appeals were taken from fifteen decisions on the eastern; forty-two decisions on the Juniata, and one hundred and seven decisions on the Delaware division; made by the canal commissioners upon claims for damages, occasioned by the construction of the canal, to the appraisers appointed

under the said act. The amount offered by the canal commissioners, and the amount awarded by the appraisers, appear from the following statement:

	Number of appeals.	Amount offered by Canal Commissioners.	Amount awarded by the appraisers.
Eastern division,	15	$1,505 00	$3,437 00
Juniata division,	42	1,428 00	11,692 00
Delaware division,	107	10,115 00	31,975 50

The awards by the appraisers upon the eastern division, were made in the year 1830, and directions were given by the board to the superintendent, to pay the amount awarded to the claimants respectively. The awards upon the Juniata and Delaware divisions, were made by the appraisers during the past season; and the record required by the act to authorise the canal commissioners to carry their proceedings into effect has not yet been received.

The sum of $33,863 25 has been paid within the last year for damages, on the following divisions of the Pennsylvania canal and rail road:

French creek feeder,	$10 00
Western division,	2198 00
Juniata division,	2.07 61
North branch division,	7508 50
West branch division,	328 00
Eastern division,	4,829 00
Delaware division,	16,832 14
Columbia and Philadelphia rail road,	50 00
	$33,863 25

By an act of the 4th April, 1831, the canal commissioners are required, should they deem it practicable and expedient to construct a chute or sluice in the Shamokin dam, on the east side of the river, for the passage of river craft, or to adopt such other measures as they may deem best calculated to ensure and preserve the safe navigation of the river at that place.

The board, in the discharge of this duty, have adopted the plan of extending the walls of the old sluice, making the whole length of the sluice as now constructed, six hundred and fifty feet, and rendering, as they believe, the navigation entirely safe, at a much less expense than it could have been effected on the east side of the river.

The West Philadelphia canal company, on the 14th instant, presented to the board a plan of the proposed canal navigation round the western abutment of the permanent bridge over the river Schuylkill, at the city of Philadelphia, to be submitted to an engineer or engineers, to be appointed by the canal commissioners, agreeably to the provisions of the 15th section of the act incorporating the company. The board therefore appointed Moncure

Robinson and D. B. Douglass, engineers, to make the re-survey and examinations required by the said act.

By the act of the 4th of April, 1831, the canal commissioners are directed to enquire and ascertain, whether the fifth section of the act of Pennsylvania passed the 19th day of February, 1801, which declares the Susquehanna down to the Maryland line, to be a public highway, has been violated by the erection of dams; the dams constructed on this river, under the authority of the state are four in number, two on the main river, and one on each of of its North and West branches; these dams vary in height counting from the bottom of the river, from 8½ to 12 feet; sluices are left in three of them, and a chute constructed in the fourth, for the accommodation of the descending trade on the river. Considerable damage however has been done during the last spring freshets, to craft passing through two of those sluices, but such improvements have since been made as will for the future render the descending navigation entirely safe. This being effected, the canal commissioners are of opinion, that the law of the 19th February, 1801, has not been violated.

By the act of the 25th March, 1831, the sum of 120 dollars is appropriated to the repair of that portion of the public road, on the south side of the river Lehigh, which was injured or destroyed by the dam across the mouth of the said river; upon examination it appears, that the sum appropriated is inadequate for the purpose, and it has been suggested that a change of the location of the road could be advantageously made, and that the object of the act would thereby be more effectually obtained.

In obedience to the directions of the resolution of the 30th of March last, a survey has been made by the engineer, upon the division for a side cut from the Juniata division of the Pennsylvania canal, to the Juniata river, nearly opposite the mouth of Tuscarora creek; the river bank opposite the mouth of that creek was found to be decidedly unfavourable for the proposed connection. The site selected is a few rods below the Perrysville ferry, and may be considered favorable; the distancee between the towing path of the canal, and the river on the line proposed is 300 feet, and the difference of level, between the surface of the canal and the river is 15 feet, to be overcome by two combined locks of 7½ feet lift each. Owing to the proximity of the canal to the river, the proposed cut will be on a line diagonal to the canal, and a basin of 100 feet in length, and 50 feet wide, must be excavated on the berm side of the canal to admit of boats turning. The whole work in estimated to cost $11,452 32 cents.

On the 6th of April last the superintendent upon the Juniata division was directed to make the necessary examinations, under the act of the 4th of April, 1831, authorising the board to settle with James McNamee, late a contractor on section 37, of the said division, for retained percentage, and materials delivered, and to pay the amount which may appear to be due. The superintendent reported to the board on the 8th of June, that the sum of $378 73

of retained percentage remained unpaid, but that no other part of the claim was founded in justice —The sum reported to be due was then directed to be paid.

In obedience to the act of the 25th of March last, the board on the 29th of March directed the superintendent upon the Susquehanna division, to contract immediately with some fit person for the construction of a chute in Snyder's dam on Penn's creek. A contract was accordingly made soon thereafter, but was abandoned in September, because the sum of two hundred dollars appropriated by the act was insufficient to meet the cost of the necessary repairs. Subsequent offers have been made to other persons, deeply interested in the navigation of Penn's creek, but the board have not found any person willing to undertake the repairs of the chute for the sum appropriated.

As a conclusion to the report of the board, detailing their proceedings in the year that has just elapsed, they thought it proper to take a concise retrospect of the rise and progress of the public canals and rail-roads of Pennsylvania, exhibiting the systematic and unwavering efforts of a great state, proceeding steadily, through a series of years, in the prosecution of a gigantic system of improvement, which, when completed, as now authorised by law, will be about seven hundred miles in length.

On the tenth of February, 1824, a report was made to the House of Representatives, by a committee of that body, recommending a survey from the termination of the Union canal, at Middletown, along the valleys of the Susquehanna, Juniata, Conemaugh, Kiskiminetas and Allegheny rivers, with a view to a continuous canal from Philadelphia to Pittsburg.

March 27th, 1824, a law was passed, authorising the governor to appoint three canal commissioners, to explore the following routes, to ascertain the practicability of constructing canals on the lines designated.

1. From Harrisburg to Pittsburg, by the waters of the Juniata and Conemaugh rivers; also, the route by the West Branch of the Susquehanna and Sinnemahoning, with the waters of the Allegheny river; and also, the country between the Schuylkill and the Susquehanna, through the great valley of Chester and Lancaster counties.
2. From a point on the river Schuylkill, in Schuylkill county, by Mahonoy creek, the river Susquehanna, the Moshannon or Clearfield and Black Lick creeks, the Conemaugh, Kiskiminetas, and Allegheny rivers, to Pittsburg.

February 2d, 1825.—A majority of the canal commissioners reported that they had surveyed about four hundred and eighty miles, between the Schuylkill river and the sources of the Juniata and Conemaugh, on the Allegheny mountain, during the previous season; and that in their opinion, a canal was practicable from east to west, and ought to be undertaken immediately by the state.—

$6,351 27, were expended on these preliminary explorations during the year 1824.

April 11th, 1825.—A law was passed directing the Governor to appoint a board of five canal commissioners, who were required to explore and survey routes for canals,

1. From Philadelphia through Chester and Lancaster counties, and thence by the West branch of the Susquehanna and the waters thereof, to the Allegheny and Pittsburg.
2. From the Allegheny to Lake Erie.
3. From Philadelphia, by the Juniata to Pittsburg; and from thence to Lake Erie.
4. From Philadelphia to the northern boundary of the state, towards the Seneca or Cayuga lake.
5. A route through Cumberland and Franklin counties, to the Potomac river.
6. A route by the Conococheague, or Monocosey and Conewago, to the Susquehanna.
7. A route through the county of Bedford, to connect the route of the proposed Chesapeake and Ohio canal, with the Juniata.

December 30, 1825, and February 3, 1826, the canal commissioners reported that four routes were levelled and surveyed, that is:

1. The several summits on the route by the West Branch of the Susquehanna.
2. Between the Sinnemahoning and Toby's creek.
3. Between the heads of the West Branch and Two Lick creeks.
4. Between Clearfield creek and the Conemaugh.

And connecting these with the surveys of the previous year at the mouth of the Juniata and at the Allegheny mountain—and also the Juniata summit, and thence by the Conemaugh, Kiskiminetas and Allegheny to Pittsburg.

After giving a preference to the most northern and Juniata routes, they state, "the board do not hesitate to say, that the practicability of a communication by one or other of the routes proposed, which shall answer all valuable and useful purposes, is satisfactorily ascertained;" and they conclude with recommending the beginning of the work by the commonwealth.

The sum of $6,575 93 was expended in 1825 for making preliminary surveys, and for expenses of the board of canal commissioners.

February 25, 1826, a law was passed directing about 54 miles of canal to be put under contract, to wit: From the west end of the Union canal to opposite the mouth of the Juniata—and from the mouth of the Kiskiminetas to Pittsburg. These portions of the line being common to all the routes proposed, were deemed most proper to commence upon.

April 10th, 1826, the governor was required by law to appoint four additional canal commissioners, thus increasing the board to nine in number.

December 11th, 1826, and February 6th, 1827, the canal commissioners reported, that they had continued the surveys and examinations of canal routes.

1. To connect the Susquehanna and Potomac rivers.
2. From the mouth of the Juniata, up that stream and thence to the mouth of the Kiskiminetas, by a canal and portage.
3. From the mouth of the Kiskiminetas to the mouth of French creek.
4. A feeder from French creek to Conneaut lake.
5. From the mouth of the Juniata, by the West Branch and Sinnemahoning, to the head of Clarion river.
6. From Northumberland to the New York line.

By that report, it appears that they had put under contract 22½ miles of the canal on the Susquehanna, and 24 miles on the Allegheny, being 46½ miles altogether, and they recommended the opening of a communication between the Eastern and Western divisions by a canal and portage road on the Juniata route: and also, a canal up the Susquehanna to Northumberland, and by the North branch to the New York line: and also, by the West branch to Bald Eagle; they likewise brought into view, connections between the Delaware and Susquehanna, the Ohio, and Lake Erie, and a canal route from the tide waters of the Delaware up that stream.

The disbursements for the year 1826, were

For preliminary surveys, including expenses of the board of canal commissioners, $15,032 74

For construction of canal, pay of acting commissioners, engineers, &c. 126,698 64

April 9, 1827, the Legislature directed a canal to be constructed from the Western termination of the Eastern division, up the Susquehanna to Northumberland, and up the Juniata to Lewistown, and from Blairsville to join the western division at the mouth of the Kiskiminetas, and also to commence a feeder from French Creek to Conneaut lake, and a canal on the Delaware between Philadelphia and Easton.

December 25th, 1827.—A report was made by the canal commissioners, showing that they had continued the preliminary surveys.

1. From Easton, up the Delaware, to Carpenter's point.
2. From the Delaware to the Schuylkill, at Philadelphia.
3. For a rail road from Philadelphia to Columbia.
4. An estimate for a canal, from the Maryland line, up the Susquehanna, to Columbia.
5. From Columbia to Middletown.
6. From Pittsburg, by the Beaver and Shenango, to Conneaut lake.
7. From Conneaut lake to Erie Harbor.
8. From the Allegheny river to Conneaut out-let.
9. From Meadville, by French creek, to Erie Harbor.
10. Another survey along the North branch.

11. Between Bennet's branch of Sinnemahoning and Sandy lick.
12. Between the West branch and Two Lick creeks.

In reference to the two latter surveys, the board used this emphatic remark: "They are therefore compelled to say, in the most explicit manner, that a navigable communication, between the eastern and western waters of Pennsylvania, sufficiently permanent to justify the expense, is wholly impracticable."

The board also reported, that they had put under contract,

18 miles of canal on the Delaware division, from Bristol upwards.
40 miles on the Susquehanna, from the eastern division to Northumberland.
44½ miles on the Juniata, from its mouth to Lewistown.
51 miles between Blairsville and Pittsburg, and
9 miles of the French creek feeder; making

162½ miles of canal contracted for in 1827.

The expenditures of the year 1827, amounted to

For preliminary surveys, including the expenses of the board of canal commissioners,	$18,355 87
Construction of canals, pay of officers, damages, &c.	913,620 54½

March 24, 1828, the legislature directed an extension of the canals along the Conemaugh, Juniata, Delaware and North Branch, not exceeding 45 miles on each stream; 25 miles on the West Branch, ten miles between Middletown and Columbia, and the French creek feeder to be carried to Conneaut lake; and also, the road bed to be prepared of 40 miles, twenty miles at each end for a rail-road between Columbia and Philadelphia.

December 11th, 1828, by the report of the canal commissioners, it appears that, in obedience to law, preliminary surveys were made,

1. Of the Ohio river, from Beaver to Pittsburg.
2. Of the Monongahela river, from Pittsburg to Brownsville.
3. Of the Allegheny river, from the mouth of the Kiskiminetas to the mouth of French creek.
4. For a portage road over the Allegheny mountain.
5. For a canal through Kishacoquillas valley.
6. For a rail-road from Harrisburg to Chambersburg, and thence by Gettysburg to York.
7. Several surveys between the Susquehanna and the head waters of the Schuylkill and Lehigh rivers.
8. Another survey from Easton to Carpenter's point.
9. Another survey of the West Branch, to the mouth of Bald Eagle.

Their report also shows that they had put under contract during the preceding season,

10½ miles of the French creek feeder.

26¼ miles of canal, from Blairsville up the Conemaugh.
45 miles on the Juniata.
23 miles on the West Branch.
45 miles on the North Branch.
35¼ miles on the Delaware.
10 miles between Middletown and Columbia.

195¼ miles of canal contracted for in 1828; and also, 40¼ miles of road formation of the Columbia and Philadelphia railroad.

Preliminary surveys expenditure included in the next year.

The amount expended in 1828, for construction, and pay of officers, &c. $2,785,612 24.

April 22, 1829, a law was passed, requiring the canal commissioners to enter into contracts for those sections on the Delaware division, and on the North Branch division, which had not then been commenced, and making it their duty to cause as much of the contracts, then made upon the different lines of canal and rail way, to be completed within the year, as should be practicable.

By an act of the 16th April, 1829, the legislature appointed a board of nine canal commissioners, to serve for one year from the first Monday of June thereafter.

December 18th, 1829, the canal commissioners reported that they had caused other surveys to be made of the east end of the Columbia and Philadelphia rail-road, and of the portage rail road over the Allegheny mountain. By their report, it appears that they had put under contract

6½ miles of canal on the Delaware, and
9 miles on the North Branch, making

15½ miles contracted for in 1829.

195 miles of canal were reported as finished and navigable; $106.000 dollars as borrowed over the appropriation, and $1,398,790 67 as due to contractors for work done. That year rates of toll upon the canal were established and a system of rules and regulations was adopted.

The sums expended in 1829, were for

Preliminary surveys, including surveys made in 1828,	$19,637 67
Construction of canals, pay of officers, damages, &c.	3,713,908 25

March 27, 1830, the legislature made it the duty of the canal commissioners to cause all existing contracts to be completed, if practicable, during that year, and to construct about three miles of canal at the east end of the western division extending to Johnstown, and also requiring another survey of the portage road over the Allegheny mountain, by three engineers.

During the same session an act was passed reducing the number of canal commissioners to three, and again vesting their appointment in the governor.

December 21, 1830, the canal commissioners reported that they had caused another survey to be made of the Allegheny portage road, and surveys of connexions between the Pennsylvania canal and the Susquehanna river at Harrisburg and Lewisburg—and that they had placed under contract and constructed three and an half miles of canal below Johnstown. They say that the water had been admitted into 406 miles of canal, and that 20 miles more were nearly completed; and 40½ miles of the bed of the Columbia and Philadelphia rail-road were graded and ready for laying the rails.

The tolls received in 1830, were 27,012 90

The disbursements for the year 1830, including surveys, construction of canal and rail roads, officers, damages, repairs, &c. 3,137,844 08

March 21st, 1831, the legislature directed the completion of the whole of the rail road from Columbia to Philadelphia, and of the Eastern division of the canal between Columbia and Middletown; also the extension of the Juniata division by canal or slack water, from Huntingdon to Hollidaysburg, and a rail road from thence across the Allegheny mountain to Johnstown; also the extension of the West Branch division, by canal or slack water, from the Muncy dam to the mouth of the Bald Eagle, and a water communication between the town of Lewisburg, and the said division; also, the extension of the North Branch division by canal or slack water from the pool of the Nanticoke dam, fifteen miles, and a towing path along said pool; also, a canal or slack water from the Allegheny river, at the mouth of French creek, up that creek to the French creek feeder, and a canal or slack water from the Ohio river, at the mouth of Big Beaver creek up that creek to the town of New Castle.

By the present report of the canal commissioners, it appears that they have put under contract during the past season:

Miles.	Perches.	
41	38,	of road bed formation upon the Columbia and Philadelphia rail road.
32	160,	of laying a single track of rails upon do. do.
36	221,	of road bed formation upon the Allegheny Portage road.
8	227,	of canal on the Eastern division between Middletown and Columbia.
38	102,	of canal and slackwater, upon the Frankstown line of the Juniata division.
3	48,	of feeder " upon do. do.
16	316,	of canal and slackwater upon the Wyoming line of the North Branch division.
	203½,	of feeder " upon do. do.

41 68, of canal and slack water upon the Lycoming line of the West Branch division.
200, the Lewisburg cross cut.
22 88, of canal and slack water upon the Franklin line of the French creek division.
22 240, of the Beaver division.

266 311¼, placed under contract in 1831.

The amount expended in the year 1831, up to the 1st of December, is $1,199,827 96.

The whole sum received by the treasurer of the canal commissioners, up to the date of their last report, is		$10,288,309 59
From which deduct the sums refunded,		41,743 13
The actual amount received by the treasurer, for canal purposes, at the date of the last report of the canal commissioners, Dec. 21, 1830,		$10,246,566 46
Amount received by the treasurer of the board, from the date of the last report, up to the 1st of Dec. 1831,	$2,092,702 37	
From which deduct amount refunded, and a balance in the treasury on the 1st of January,	4,780 21	
		2,087,922 16
The whole amount received for canal purposes, up to the 1st of December, 1831,		$12,334,488 62
Deduct the whole amount disbursed up to the 28th February, 1831, as per the accounts of the canal commissioners, settled by the Auditor General,		10,677,683 76
Balance,		$1,656,804 86
Amount disbursed from the 28th of February to the 1st of December, 1831,	$1,199,827 96	
Amount advanced to superintendents and supervisors, for which accounts are in a train, for settlement,	249,449 83	
		1,449,277 79
Balance in the treasury upon the 1st Dec. 1831,		$207,527 07

Signed by order of the board,
JAMES CLARKE, *President.*

ATTEST,
FRS. R. SHUNK, *Sec'y.*
Harrisburg, December 15, 1831.

A.

ARTICLE OF AGREEMENT, entered into this day of one thousand eight hundred and by and between the COMMONWEALTH OF PENNSYLVANIA, by perintendent on the Division of the Pennsylvania canal, of the one part, and of the other part,

Witnesseth, That the said do promise and agree to dig, embank, puddle and construct, in a substantial and workmanlike manner, all that part of the Division of the Pennsylvania Canal, known and designated as the section, upon the plan of the line of said Division, in the following manner, to wit:

The canal banks to be so constructed, that the water may at all places be at least forty feet wide at the top water line, twenty-eight feet wide at bottom, and four feet deep. Each of the Banks shall be at least two feet above the top water line, and such a slope shall be preserved on the inner side of the banks, both above and below the top water line, as that every foot perpendicular rise shall give an horizontal base of eighteen inches, the towing path shall be on the river side of the canal, its surface shall be at least ten feet wide, and the bank opposite the towing path shall be at least seven feet wide, and both banks shall have a declination from the inner to the outer edge thereof, equal to half an inch for every foot of surface; the banks shall be constructed of pure, solid and compact water proof earth, and they shall be made smooth and even, with a slope on the outermost side, not less than is above mentioned. And it is further agreed, for the purpose of giving to the banks the necessary connexion with the earth upon which they are to be erected, that all the grass, trees, bushes and stumps, on the space to be occupied by the canal banks, together with all logs, brush, roots and vegetable matter of all descriptions, shall be wholly removed at least fifty feet from the centre of the canal; and it is further agreed that all necessary grubbing shall be executed according to the directions of the engineer appointed by the canal commissioners of Pennsylvania, and when required that a puddle ditch shall be excavated under the seat of each bank, of such breadth and depth, and shall be carried up to such a height within the embankment, as may be designated by the engineers.

And the said to be paid for completing this contract as follows:

For grubbing and clearing, the sum of

For all necessary excavation within the banks of the canal, puddle ditch and towing path be the same of earth, gravel, loose stones, clay, loam or sand, per cubic yard.

For embankment, when removed over one hundred feet, and to be measured in the banks, per cubic yard.

For cemented gravel or hard pan, strictly such, per cubic yard.
For solid or blast rock, per cubic yard.
For detached rock measuring more than one cubic foot, and for slate rock, per cubic yard.
For pudling, per cubic yard.
For vertical wall, per perch of 25 cubic feet.
For outside slope wall, per perch of 25 cubic feet.

It is understood by the parties, that under the term *excavation*, are included all drains that may occur on the section; and under the term *embankment* is included the filling in of bridges, and that in all cases the earth for embankment shall be taken from such places as may be directed by the superintendent or engineer on the line. It is also understood that no allowance shall be made for the bailing of water.

It is further agreed, that any items of work, that may necessarily occur on this section, not already specified in this contract, shall be estimated by the engineer, and paid for accordingly. And it is further understood by the parties that all stone quarried from the bed of the canal is the property of the commonwealth of Pennsylvania, and not of the contractor, and may be disposed of by the superintendent as he may think proper; and that all timber, buildings or fences on the track of the canal, are the property of the landholder, and the said contractor to be responsible for the safe keeping of the same from the depredations of hands and laborers.

The payments to be made in the following manner: On or about the day of next ensuing the date of this contract, the said engineer shall estimate the quantity of work done, and upon his certificate being presented to the superintendent, the amount thereof shall be paid, deducting therefrom fifteen per cent.; and on or about the day of each succeeding month, within the limits of this contract, the like estimate shall be made, certificate granted, and payment in like proportion made thereon. The fifteen per cent directed to be retained to be withheld until the contract is completed, unless the board of canal commissioners shall direct the same or any part thereof to be sooner paid: And further, at the expiration of the stipulated period for the completion of this contract, if the whole work shall be finished to the satisfaction of the said superintendent, the said engineer shall estimate it, and within twenty days after the presentation of his certificate to the superintendent the balance which may remain due shall be paid.

It is further agreed between the parties, that when the superintendent on this division shall give notice in writing, or by public advertisement, that the sum of money appropriated towards the expenses of this division, for the present year shall have been expended, that any subsequent labor performed under this contract, shall not be considered as incurring a debt against the state, con-

trary to the true intent and meaning of the 7th section of the act of the 21st of March last.

And the said
do further promise and agree, that will from time to time during the progress of the work conform to such deviations from the present line of the canal, and to such alterations in the form, slope, and dimensions of the banks, towing paths or any other part of the works, as the said engineer may direct. And it is mutually agreed that the decision of the said engineer shall be final and conclusive, in any dispute which may arise between the said parties.

And the said
do further agree, that will not re-let or transfer said contract, or any part thereof, to any other person or persons whatever. And that will personally superintend the work during its progress.

It is further agreed between the parties, that in case the work upon this section shall not be commenced within days from this date; or if at any subsequent period the said should, in the opinion of the superintendent or engineer, refuse or neglect to prosecute this contract with a force proportioned to the quantity of work to be done, and the period within which it is to be completed; or shall sub-contract or re-let said section or any part thereof; or shall not give personal superintendence to the work, the said engineer shall have power with the consent of one of the canal commissioners to determine that this contract has been abandoned, and such determination shall put an end to this contract, and exonerate the commonwealth from every obligation thence arising; and the superintendent may immediately proceed to dispose thereof in the same manner as if it had never existed. And to avoid disputes, as well as interruption and hindrance to the regular and peaceable progress of the different parts of the work, and to prevent unnecessary injury to the rights and property of the neighbours in the vicinity of the canal, the superintendent, engineer, or assistant engineer will dismiss from the service, every quarrelsome disorderly person, and such as shall be addicted to habits of intemperance, or who shall wantonly commit any unnecessary trespass, either upon the person, land, or property of citizens living, travelling, or working upon or near the works of the said canal, or be guilty of other offensive misconduct; and every contractor shall dismiss all similar persons employed under him, whenever thereto directed by the superintendent, engineer, or assistant engineer.

And the said
do promise and agree to finish and deliver up this contract on or before the day of in the year 183

This contract not to be binding on the commonwealth, until approved by the board of canal commissioners.

In witness whereof, the said parties have hereunto set their hands and seals the day and year first above mentioned.

WITNESS,

[L. S.] *Superintendent.*
[L. S.]
[L. S.]
[L. S.]

Extract from the 6th Section of the act of the 25th February, 1826.

"No extra allowance shall in any case be made for the performance of any such contract beyond the sum stipulated therein."

B.

Rates of Toll to be charged on the Pennsylvania Canal, from and after the 1st day of May, A. D. 1831.

ARTICLES.	PER TON, &c.	TOLL per mile.
		c. m.
On Ashes, leached and manure,	Per ton	0 6
Ashes, pot and pearl,	ton of 7 barrels	1 5
Agricultural productions not particularly specified,	ton	1 5
Agricultural instruments and carts, wagons, sleighs, ploughs, and mechanics' tools necessary for the owner's individual use, when accompanied by the owner emigrating,	ton	1 5
Bark, if in boats,	cord,	1 0
Do. if in rafts,	cord,	2 0
Do. if ground,	ton,	1 5
Beef salted,	ton of 8 barrels,	1 5
Brick,	ton of 500,	7½
Boards, planks and scantling, reduced to inch measure, and all siding lath, and other sawed stuff less than an inch thick, if conveyed in boats and scows down stream,	1000 feet board measure,	1 0
Do. if conveyed in boats and scows up stream,	1000 feet board measure,	1 2½
The same if conveyed in rafts, up or down,	1000 feet board measure,	2 0
Butter, lard and cheese,	ton,	1 5

ARTICLES.	PER TON, &c.	TOLL per mile
		C. M.
Barley,	ton of 50 bushels,	1 5
Beer,	ton of 8 barrels,	1 5
Cider,	ton of 8 bbls. or 2 hhds.	1 5
Clay, earth, sand and gravel,	ton,	6
Charcoal,	ton,	1 5
Coal, mineral,	ton,	5
Corn, Indian,	ton of 40 bushels.	1 5
Cotton,	ton,	1 5
Dry goods and merchandize,	ton,	3 0
Deer, buffalo and moose skins,	ton,	2 0
Furs and peltry, (except deer, buffalo and moose skins,)	ton,	3 0
Flour,	ton of 10 1-2 bbls.	1 5
Fish, salted,	ton of 7 1-2 bbls or 14 half bbls	1 5
Furniture, household,	ton,	2 0
Grindstones,	ton,	1 5
Gypsum,	ton,	1 5
Groceries,	ton,	2 0
Hay,	ton,	1 0
Heading for barrels, if carried in boats or scows,	ton of 500	7½
Do. for hogsheads, do. do.	ton of 400	
Hoop poles for bbls. if carried in boats or scows,	ton of 400	7½
Do. for hogsheads, do. do.	ton of 200	
Heading, or hoop poles for bbls. or hhds. if transported in rafts,	ton,	1 5
Hardware,	ton,	2 5
Hemp, and hempen yarns,	ton,	1 5
Iron ore,	ton,	1 0
Do. pigs and broken castings,	ton,	1 5
Do. castings, blooms and anchonies,	ton,	2 0
Iron bar, rolled, slit or hammered,	ton,	2 5
Lead, pig,	ton,	1 2½
Do. white,	ton,	1 5
Lime,	ton of 28 bushels.	1 0
Limestone,	perch,	7½
Liquors, (except whiskey and other domestic distilled spirits,)	ton of 2 hhds, or 8 bbls.	2 5
Lath, split,	ton,	1 0
Marble, unwrought,	ton,	1 5

Articles.	Per Ton, &c.	TOLL per mile.
		c. m.
Marble manufactured,	ton,	2 5
Millstones and French burrs,	ton,	1 5
Oats,	ton of 80 bushels	1 5
Oysters,	ton of 4000.	3 0
Pork, salted,	ton of 8 barrels.	1 5
Posts and rails split for fencing, if carried in boats or scows,	hundred,	5
The same if conveyed in rafts,	hundred,	1 0
Queensware and earthenware,	ton	2 5
Rye,	ton of 40 bushels,	1 5
Rosin,	ton of 8 barrels,	2 0
Salt, fine,	ton	1 5
Do. coarse,	ton	1 5
Stone, entirely unwrought,	perch	6
Do. wrought,	perch	1 0
Seed clover,	ton of 40 bushels,	1 5
Do. flax,		
Do. of all other kinds,		
Straw,	ton,	1 0
Slate and tile for roofing,	ton,	1 5
Shingles, if conveyed in boats or scows,	thousand,	5
Do. if conveyed in rafts,	thousand,	1 0
Staves for pipes if conveyed in boats or scows,	ton of 400	
Do. for hogsheads, do.	ton of 500	7½
Do. for barrels, do.	ton of 600	
The same if conveyed in rafts,	ton,	1 5
Tar,	ton of 7 bbls. 28 gals. each,	2 0
Tobacco, not manufacturered,	ton,	1 5
Timber, round and square, if conveyed in boats or scows,	100 cubic feet,	1 0
Do. if conveyed in rafts,	100 cubic feet,	2 0
Wheat,	ton of 40 bushels,	1 5
Whiskey & other domestic distilled spirits,	ton of 2 hhds. or 8 barrels,	2 0
Window glass,	ton of 2800 feet,	2 0
Wood for fuel, if conveyed in boats or scows	cord,	1 5
Do. if conveyed in rafts,	cord,	3 0
On all articles not enumerated passing southward or eastward,	ton,	1 5

Articles.	Per Ton, &c.	Toll per mile.
		c. m.
On all articles not enumerated passing northward or westward,	ton,	3 0
On all boats or other vessels made and used wholly for the transportation of property,	mile,	3 0
On all boats and other vessels made and used for the transportation of persons, as well as property,	mile,	5 0
On all boats or other vessels made and used chiefly for the transportation of persons,	mile,	25 0
Or on each passenger in packet boats over twelve years of age,	mile,	7½
And on the same boat or vessel,	mile,	8 0
At the election, of the proprietors, Provided they render such satisfactory accounts of the passengers as may be required, and make such election when their boats commence business for the season.		
On each passenger transported in boats or vessels, used chiefly for the transportation of property over twelve years of age,	mile,	0 5
On each passenger in freight boats over twelve years of age,	mile,	0 5

For passing out-let locks at Middletown and Columbia.

On every loaded ark,	$1 00
Do. empty ark,	50
Do. loaded boat,	75
Do. empty boat,	50
Lumber of all kinds in rafts or platforms, at the rate per 1000 feet, board measure, of	08

EXPLANATION.

Horses, cattle, and all other live stock, the raw hides of domestic animals, are to be considered within the term "agricultural productions;" and each horse is to be estimated at six hundred weight.

I certify that the foregoing is a true copy of the rates of toll to be received upon the Pennsylvania canal, as established by the board of canal commissioners, by their order of the 9th April, 1831.

FRANCIS R. SHUNK, *Sec'ry.*

REPORT

OF THE

CANAL COMMISSIONERS

OF

PENNSYLVANIA.

READ IN THE HOUSE OF REPRESENTATIVES, DECEMBER 7, 1833.

HARRISBURG:

PRINTED BY HENRY WELSH.

1833.

REPORT.

CANAL COMMISSIONERS' ROOM,
December 2, 1833.

His Excellency GEORGE WOLF,
Governor of Pennsylvania.

SIR—By order of the board of canal commissioners, I have the honor of transmitting to you their annual report, for the year ending on the first of November last, and accompanying documents.

I am yours, very respectfully,
JAMES CLARKE, *President.*

The Canal Commissioners respectfully submit the following REPORT:

As the public improvements of Pennsylvania, which have been required by law to be constructed, at the expense of the State, are approximating to completion, it may be useful and satisfactory to the citizens of the Commonwealth, to present them with an account of the commencement and progress of the most splendid system of internal improvement, that has ever been undertaken and executed in so short a period, by any country.

The first law authorizing the construction of canals and rail-roads, exclusively at the expense and for the benefit of the Commonwealth, was passed on the 25th of February, 1826, and on the 4th of July in the same year, the first ground was broken near Harrisburg.

The several lines were put under contract in the following order:

In 1826.	On the Eastern division,	22½	miles.
	On the Western division,	24	
	Miles of canal,		46½
In 1827.	On the Western division,	51	miles.
	On the Juniata division,	44¼	
	On the Susquehanna division,	39	
	On the Delaware division,	18	
	On the French Creek Feeder,	9	
	On the Eastern division,	1½	
	Miles of canal,		162¾

In 1828.	On the North Branch division,	46	miles.
	On the Juniata division,	45	
	Navigable feeder on do.	1	
	On the Delaware division,	35½	
	On the Western division,	26½	
	On the West Branch division,	24	
	On the French Creek feeder,	10½	
	On the Eastern division,	10	
	Miles of canal and navigable feeder,		198½

There were also forty and a half miles of road bed formation, on the Columbia railway, placed under contract, being equal to about two fifths of the cost of a finished railway with double tracks, or say about sixteen miles of a double track of railway, 16

Miles of railway, canal and feeder, 214½

In 1829.	On the North Branch division,	9½	miles.
	On the Delaware division,	6¼	
	Miles of canal,		15¾

The foregoing four hundred and thirty-nine and a half miles of railway, canal and navigable feeder, have been denominated the "old lines," and those subsequently placed under contract are called the "new lines."

In 1830. On the Western division, 3½ miles of canal, 3½

In 1831.	On the West Branch division,	42¼	miles.
	The Lewisburg side cut,	½	
	On the Juniata division,	38½	
	On do navigable feeder,	3¼	
	On the Beaver division,	22¾	
	On the French Creek division,	22¼	
	On the North Branch division,	17	
	On do do navigable feeder,	¼	
	On the Eastern division,	9	
	Miles of canal and feeder,		155¾

There were forty-one and a fourth miles of road bed formation, and thirty-two and a half miles of single track of rails of the Columbia railway, put under contract, (of which twelve and a half miles of the single track of rails was by law suspended,) being equal in cost to about twenty-two and a half of railway, finished, with double tracks, 22½

There was also put under contract thirty-six and three fourths miles of road bed formation, upon the Portage railway, being equal in cost to about fourteen and three fourths miles of railway, with double tracks, 14¾

Miles of railway, canal and feeder, 193

In 1832. On the French Creek feeder, 4 miles.
On the Beaver division, 2
On the West Branch division, 1½

Miles of canal, 7½

There was also put under contract one fourth of a mile of additional length of road bed formation, through the city of Lancaster, and twenty-four miles of single track of rails, on the Columbia railway, being equal in cost to about seven and a half miles of railway completed, 7½

Also, forty-four miles of single track of rails, on the Portage railway, being equal in cost to about thirteen and a half miles of double track of railway, completed, 13½

Miles of canal and rail-road, 28½

In 1833. On the Beaver division, of towing-path along the pool of the Shenango dam, 6 miles.
On the West Branch division, the Bald Eagle side cut, 3½
On the Western division, of navigable feeder at the town of Conemaugh, 1½

Miles of canal and feeder, 11

Contracts have also been made for laying a double track of rails on sixty miles of the Columbia railway, being equal in cost to about thirty-six miles of double track of railway completed, 36

Miles of railway, canal and feeder, 47

RECAPITULATION.

			Miles.
Placed under contract in	1826,		46½
Do	do	1827,	162¾
Do	do	1828,	214½
Do	do	1829,	15¾
Do	do	1830,	3½
Do	do	1831,	193
Do	do	1832,	28½
Do	do	1833,	47

Miles under contract, 711½

There is yet to be put under contract on the Portage railway, the laying of the rails on about twenty-eight and a half miles of single track, which will be equal to the cost of completing a railway, with double tracks, on eight and a half miles, $8\frac{1}{2}$

Length of the whole improvements, Miles 720

December eighteenth, 1829, the Canal Commissioners reported that one hundred and ninety-five miles of canal were finished; but of this distance, only one hundred and eighty miles were so situated as to be partially navigable, on which, twenty-seven thousand and twelve dollars and ninety cents of tolls were received in 1830.

On the twenty-first of December, 1830, four hundred and twenty-six miles of canal were reported as finished, and the water had been introduced into four hundred and six miles: but owing to its detached situation and insecure condition, only three hundred and ten miles could be used for navigation, on which, thirty-eight thousand two hundred and forty-one dollars and twenty cents of tolls were received in 1831.

By the report of December fifteenth, 1831, it does not appear that any part of the public works prosecuted that year, was finished; hence nothing was added to the four hundred and twenty-six miles reported as finished the preceding year. It appears, however, that eighty-seven miles were added to the navigable portion of the canal, and this, with the three hundred and ten miles of the preceding year, made three hundred and ninety-seven miles, on which, fifty thousand nine hundred and nine dollars and fifty-seven cents of tolls were received in the fiscal year, ending the thirty-first October, 1832.

On the first of November, 1832, four hundred and eighty and a half miles of canal and navigable feeder, were reported as finished, and also twenty-two miles of a single track of rail-way; of which, only four hundred and sixty-one miles of canal and eighteen miles of rail-road could be advantageously used; the tolls on which, during the past year, ending on the thirty-first October, 1833, amounted to one hundred and fifty-one thousand four hundred and nineteen dollars and sixty-nine cents.

In addition to the number of miles of canal and rail-way which was reported last year as finished, there has been added, within the present year, a second track on the twenty-two miles at the eastern end of the Columbia rail-way; and a single track on the remaining sixty miles of that road will be ready for use by the first day of January, 1834.

On the Portage rail-way, a single track along the whole road, thirty-six and three-fourths miles, and a double track on the inclined planes, will be ready for use in all this month.

It is also expected that, before the setting in of winter, water will be introduced into twenty-four and three-fourths miles of the Beaver division, twenty-two and one-fourth miles of the French creek division,

and one and a half miles of the feeder at the town of Conemaugh, on the Western division.

Four years experience has convinced the board, that with an adequate supply of funds for the purpose of making necessary repairs during the winter, the canals of Pennsylvania, in ordinary seasons, can be opened for navigation by the tenth of March; and the present condition of the improvements warrants them in assuring the public, that the following lines will be ready for use at the opening of the navigation next spring.

A rail-way from Philadelphia to Columbia, twenty-two miles, with double tracks, and sixty miles with a single track, making	82 Miles.
A canal from Columbia to Hollidaysburg,	171¾
Portage rail-way over the Allegheny mountain, between Hollidaysburg and Conemaugh, from basin to basin,	36
A canal from Conemaugh to Pittsburg,	104¼
Distance from Philadelphia to Pittsburg,	394 Miles.
A canal from the junction on Duncan's Island, near the mouth of the Juniata, up the Susquehanna and North Branch to the mouth of Solomon's creek, in Luzerne county, (two hundred and twenty-three miles distant from Philadelphia,)	96¾
A canal from the junction at Northumberland, up the West Branch to the head of the pool of the Muncy dam, in Lycoming county, (one hundred and ninety and a half miles from Philadelphia,)	26½
A canal from Bristol to Easton, on the Delaware, (eighty miles from Philadelphia,)	59¾
A canal from the Ohio river, twenty-eight miles below Pittsburg, up the Big Beaver creek to New Castle, in Mercer county,	24¾
A canal from the Allegheny river at the town of Franklin, up French creek to near the feeder aqueduct, in Crawford county,	22¼
The continuation of the Portage rail-way along side of the basins at Hollidaysburg and Conemaugh—the Conemaugh feeder and Alleghenytown branch on the Western division—the South fork and Raystown feeders on the Juniata division—and the Lewisburg side cut on the West Branch division, form an aggregate of	8
Number of miles of canal and rail-way ready for use,	632

OLD LINES OF CANAL.

Those portions of the canal which have been declared navigable are all at present in excellent condition, and commerce upon them is brisk. The public is beginning to experience the benefits of the improvement, and duly to appreciate its advantages.

In the years 1831 and 1832, the Western division of the canal, and the dams on the Susquehanna, were much damaged by floods; the extensive and disastrous injuries done to these works, (*defective in many instances in their original construction,*) by frequent and high freshets, were repaired as speedily as the limited funds appropriated for such purposes would permit. The new banks, and mechanical structures then made, have since proved their solidity, by resisting uninjured both frosts and freshets.

Expenses to a large amount were incurred, in re-constructing and strengthening many important works, on all the lines. In many places, particularly on the Delaware division of the canal, banks were originally composed of sand, which was frequently washed away, and had to be replaced by gravel and other substantial materials. In some instances, the distance between where the materials were got, and where they were used, added considerably to the expenses of current repairs.

In making repairs, the supervisors have been instructed to have them done in the most substantial manner, and the beneficial effects of an adherence to those instructions, have been visible in all the lines during the last year. Most of the weak points in the canal banks and mechanical structures, have been thoroughly repaired; and the board have every reason to believe, that with proper attention on the part of the supervisors, and other agents entrusted with the immediate care of our public works, disasters of a serious character can seldom occur hereafter.

MAIN LINE.

The navigation of the canal between Portsmouth and Pittsburg, has been but little interrupted for the last year, except by ice, which closed it on the east side of the mountain on the twentieth of December, and on the west side on the tenth of January; and it opened on both sides of the mountain from the tenth to the sixteenth of last March. At two of the western collectors' offices, Blairsville and Leechburg, *toll was taken in every month of the year.*

In the month of May last, one of the highest floods known for many years, took place in the Susquehanna. The canal, in many places on the Eastern division, was entirely covered with water; but after the flood had subsided, it was found that very little injury had been done, owing, in a great measure, to the solidity the canal banks had acquired since their construction; and it is gratifying to state, that the navigation was not at that time interrupted for more than forty-eight hours. The damages done by the flood, as well as a few breaches that occurred during the season, were promptly repaired. The commerce upon this division was slightly impeded for a short time, in the month of September, when so much water escaped through the dam at Clark's Ferry, at a very low stage of water in the river, that the canal could not be sufficiently filled; hence gravelling the dam had to be commenced, which at its original construction was not considered necessary. At the same time the water was taken from the

Columbia line, to make some necessary repairs, preparatory to the opening of the Columbia railway. A feeder for this line, to be taken either from the Swatara, or the river at Conewago falls, is believed to be indispensible for an active trade.

Neither the Juniata nor Western division has been injured by floods during the past season. Upon the Juniata several breaches have occurred. The only injury of any magnitude sustained by the Franks-town or "new line," above Huntingdon, (which passes through difficult mountain defiles,) since the introduction of the water in November, 1832, was one span of an aqueduct that gave way, and required rebuilding; and at the same time a very heavy bank breach took place, both of which were completely repaired, and the navigation restored in the short period of only *six days*.

Guard gates have been erected and the canal banks raised in the Long Narrows. A range of crib work has been constructed below the dam near the same place, and a new trunk has been put into the large aqueduct at Duncan's Island. Two spans of the aqueduct at Shaver's ford have failed and must be renewed; and another pair of gates must be built in the Long Narrows, so as to form, with those already erected, a guard lock.

No breaches worth noticing have occurred upon the Western division during the past year. The commerce on the canal between Blairsville and Pittsburg has been but little delayed throughout the season, except for two or three weeks in the latter end of August and beginning of September, when the Conemaugh and Kiskiminetas rivers became so low that a full supply of water, (as the dams are not perfectly tight,) could not be maintained in the canal. Still, however, although at that time boats *fully loaded* could not run, yet by the aid of scows there was *no time* when the forwarding merchants had to detain their goods at Blairsville for twenty-four hours for the want of water.

The board would here solicit the especial attention of the Legislature and of the public, to this important fact:—*That the navigation of the main line of the Pennsylvania canal, was maintained throughout the season with but slight delays.* Notwithstanding which, men interested in depreciating our public works, or governed by mistaken policy, were but too successful, by exaggerated statements of breaches and failures, in deterring western merchants and others from using the canal as a medium of transportation. The effect of these misrepresentations has been a serious injury to the trade of Philadelphia and Pittsburg, and to the revenue of the Commonwealth.

During the period when little business was doing upon the canal *above* Blairsville, it was thought adviseable to draw off the water from the Ligonier line, for the purpose of making repairs at several points. This was deemed important, as the opening of the Portage railway will bring that line of canal into active use. The most urgent of those repairs have been made, and the residue can be done during the ensuing winter.

A feeder of one mile and one hundred and seventy-three perches, has been constructed at Conemaugh town, with a dam in Stoney creek

threeh undred and fifty-eight feet long and seven feet high—a guard lock, two square culverts, and six bridges. The feeder is eighteen feet wide at bottom, thirty feet wide at top water, and four feet deep.

To guard against the effects of a very dry season, when there is an active trade upon the canal, it will be necessarry to construct one or more reservoirs on Stoney creek, or the Little Conemaugh.

Three heavy and expensive outside protection walls had to be built upon the Western division, within the last year, to defend exposed points of the canal banks against the floods of the river. New trunks and inner arches were also required in the two large aqueducts over the Allegheny river; the timber for them has been procured, and it is chiefly all prepared for putting up, which will be done the ensuing winter, when the water is out of the canal. Ice breakers have been built to protect several piers of the aqueducts which were most exposed to injury.

A strong crib work has been built below the Leechburg dam, in the Kiskiminetas river, to secure the dam from undermining, by the reaction of the water falling over it. This crib work is five hundred and fifty feet long, across the stream, thirty feet wide at the base, and twenty-four feet wide at the top, measured with the thread of the stream. It is sunk in water averaging twenty-six feet deep, and contains sixty-three thousand feet of timber, twenty thousand pounds of iron, and eleven thousand one hundred and seventy-six cubic yards of stone filling.

The dam has now a base of one hundred and twenty-eight feet, and its average height, from the bed of the river to the comb, is thirty-four feet, or twenty-three feet above low water. It contains three hundred and seven thousand feet of timber, one hundred and twenty-six thousand pounds of iron, and forty-eight thousand three hundred and twelve cubic yards of stone filling.

Dam No. 2, on the Kiskiminetas, also requires a crib work below it, the timber of which is provided, and will be put in this season. The out-let lock in Alleghenytown, owing to a defect in the foundation, had to be taken down, and it is exceedingly difficult to re-build it in the gravel bed of the river. An out-let lock in the Kiskiminetas has also failed, and must be taken down and re-built this winter. The Monongahela branch of the canal in Pittsburg, has been rendered useless, being filled with mud, which is carried down from the neighboring heights by heavy rains. By the estimate of the engineer, it will require nine thousand nine hundred and fifty-eight dollars, to construct sewers for avoiding the mischief. A number of water-ways around locks, and other necessary works, had to be suspended for want of funds.

SUSQUEHANNA LINES.

The navigation on the North Branch division closed about the eighth or tenth of December; and on the West Branch and Susquehanna divisions, on the twentieth of December, 1832. The Susquehanna division opened last spring, on the twentieth of March, but owing to damage done by a flood on the North Branch, and by wa-

termen on the West Branch canals, little business was done until about the twelfth of April. On the fourteenth of May, the navigation was suspended by the great flood, and was not again resumed throughout the lines until the twenty-fifth of July. Since then, but few interruptions have taken place.

On the twenty-fifth of March last, the watermen engaged in running arks and rafts down the West Branch of the Susquehanna, made a breach in the canal a short distance below the Muncy dam, through which they passed with their craft, and which cost to repair it nineteen hundred and seventy-six dollars and sixty-six cents. About the middle of May, both branches of the Susquehanna rose to an unusual height. On the West Branch division, an extensive breach was made through the protection wall, near the pier head at the entrance of the canal into the Muncy dam; and the water from the river broke into the canal below the guard-lock, and passed out again about five miles further down, making a large breach at each place, destroying several bridges, and doing much damage to the banks. The repairing of these disasters, cost sixteen thousand and thirty dollars and ninety-seven cents. The damages thus sustained, were so far repaired as to admit the water again into the canal on the fifth of June. Since then, there has been but little interruption to the navigation.

The North Branch division rose twenty-eight feet above low water mark, and covered the canal for nine miles down from Nanticoke dam. The lock-house at the guard lock was carried away; the abutment of the dam, and a quantity of protection wall were thrown down, and the canal was partially filled with sand for a long distance. Serious and extensive injury was done at many places to the canal banks by breaches, and washing away the lining. Those injuries were repaired, and the canal again opened for navigation on the nineteenth of June.

On the Susquehanna division, several bridges were destroyed; the water also broke around the stone abutment attached to the short feeder dam which connects with the wall of the chute at the Shamokin dam, and washed away so much of the bank as to endanger the safety of the canal. But the most formidable breach, and the one which required the most time to remedy, was at Penn's Creek, where the mound which carries the canal across one of the branches or outlets of that stream, was entirely carried away. When the work upon this breach was nearly completed, it was a second time swept off, by a sudden rise in the creek. These breaches have been substantially repaired; the stone alone, used for that purpose, cost fifteen thousand and ninety-four dollars and thirty-five cents. To the above causes is to be attributed the delay in opening the navigation upon those lines, in the spring, and the length of time during which it was suspended. It is believed that, by the erection of a few safety gates, which are now in progress, and the strength of the repairs which have been made at weak and exposed points, but little danger may hereafter be apprehended from floods in the river.

The chutes of the Nanticoke and Shamokin dams, have given but little interruption to the river trade during the past season; the one at the Muncy dam was for a while unsafe, but it has been repaired, and they are all at this time in good condition.

In 1832, a portion of the Nanticoke dam on the North Branch, was carried away by a freshet in the river, and has since been replaced by a new dam built on a better plan. In last month, one hundred and thirty feet of the old part of this dam was also carried off; preparations are now making to rebuild it.

A feeder from Fishing Creek should be introduced into the North Branch division, to obviate the present necessity of supplying the canal with water for fifty-four miles, from the Nanticoke dam. This will be rendered still more necessary, when the trade upon that division shall have increased, by the completion of the Wyoming line.

DELAWARE DIVISION.

The Delaware division of the Pennsylvania canal, is destined to become one of the most profitable lines in the State, on account of the mineral coal that must pass through it to market. During the past season, this line has suffered severely from the effects of extraordinary floods in the Delaware river and some of its tributary streams, which cross the line of the canal.

In December, 1832, and in May, June and October, 1833, extensive breaches occurred, which required large expenditures to repair: and in addition to the effectual repairing of breaches, weak points in the banks have been strengthened—the dam in the Lehigh river at Easton, has had crib work sunk below it for its support—a large water way has been constructed round the guard lock at that place—several other water ways and waste wiers have also been made—and a few safety gates erected; some more of which are yet required for the entire security of the canal. These new works have cost about fifteen thousand dollars.

Some difficulty still exists in filling the thirty-five miles of canal between Easton and New Hope with water, especially after the water has been withdrawn for the purpose of doing repairs. It has been suggested that a feeder from the Delaware river near Black's Eddy, would remedy the evil. The expense of such a feeder, is estimated at forty thousand dollars. The water works at New Hope have been completed, and are a valuable improvement.

FRENCH CREEK FEEDER.

This isolated piece of canal was put under contract in 1827 and 1828, and for several years past, has been reported among the finished lines, although, as it could not be filled with water, it was entirely useless. Since it was taken off the contractors' hands, it has been going to decay for want of repairs. A commencement was made, during the summer, to put it in repair, so as to be ready for the reception of water upon the completion of the new lines; but it proved an arduous as well as expensive undertaking, and had to be suspended for the want of funds.

A weigh lock at Alleghenytown, which was put under contract i 1832, has been finished, and its utility proved. Four other weigh locks have been put under contract. The one at Portsmouth and the one at Easton are completed and in use, and the one at Hollidaysburg will be finished this season. The one at Northumberland had to be suspended for want of funds. The lock at Easton weighs one hundred tons, and the others eighty tons each. Those that have been finished are so accurate, that from twenty-five to fifty pounds will turn the beam. Weigh locks upon the canal are indispensible, for ascertaining the correct tonnage of boats and for preventing frauds upon the revenue, and also for protecting those engaged in the business of transportation from imposition. A few more are required.

The following is a summary of the work upon which the appropriation of the twenty-seventh March, 1833, for new work upon old lines, has been expended.

Weigh locks, scales, &c.	$19,826 08
Waste wiers,	6,639 34
Fence,	5,201 77
Lock house, lots, &c.	3,578 22
Locks,	1,065 79
Aqueducts,	4,821 99¼
Feeders,	9,623 61
New Hope dam, &c.	10,008 09
Bridges,	3,067 30
Sections,	2,720 91½
Completing first ten miles of the Columbia line, &c.	14,363 97
Protection wall,	893 50
Collectors office,	908 17
Safety gates,	3,457 53
Removing buildings,	126 25
Engineers,	644 00
Contingencies,	868 52
	$87,315 06

The whole amount drawn by superintendents in 1833, out of the old work fund, is		$98,128 52
Amount expended as above stated,	$87,315 06	
Amount drawn by superintendents out of former appropriations, for old work, and not included in the above expenditures of this year,	6,275 00	
Amount unaccounted for in the hands of superintendents,	4,538 46	
		$98,128 52

There is due out of this fund, for work done on the Conemaugh feeder, $11,572 25

ABSTRACT OF EXPENDITURES FOR REPAIRS IN 1833.

For Dams,	$21,524 68
Locks,	3,374 65
Aqueducts,	18,188 04
Waste Wiers,	13,301 37
Culverts,	2,525 00
Bridges,	7,786 39
Protection Wall,	28,646 99
Gates,	1,023 08
Current Repairs,	179,013 37
	$275,383 52

The current repairs upon the several divisions, which cost as above stated, the sum of one hundred and seventy-nine thousand and thirteen dollars and thirty-seven cents, include the repairs of breaches, gravelling dams, strengthening banks, slating towing-paths, &c., and are as follows:

	Miles.	
Eastern division,	45	$12,463 53
Juniata division and feeders,	132	15,748 33
Western division,	105	23,854 15
Susquehanna division,	37	20,579 56
West Branch division,	26½	20,956 27
North Branch division,	59½	20,304 19
Delaware division,	59¾	59,408 33
French creek feeder,	19½	5,699 01
		$179,013 37

STATEMENT OF THE FUND FOR REPAIRS.

Whole amount drawn by supervisors in 1833,	$302,081 84
Balance in the hands of supervisors, November 1, 1832,	4,172 21
	$306,254 05
Amount paid for work done and materials, previous to 1st November, 1832,	105,976 72
Amount of the appropriation of 1833 for repairs, drawn and applicable for the work of the year,	$200,277 33
Whole amount of the cost of repairs made in 1833,	$275,383 52
Deduct the available funds drawn,	200,277 33
Amount of debts due,	$75,106 19
Balance of the fund in the Treasury, November 1, 1833,	10,807 61
Amount required,	$64,298 58

Upon the settlement of the accounts of a former supervisor, whose debts for repairs made prior to the 1st November 1832, were not ascertained by the board at the date of their last report and upon a full settlement of the accounts for repairs made, and debts of that year paid, it appears that the actual sum due on the first November 1832, exceeded the estimate then made by the Canal Commissioners. These debts continue to accumulate throughout the winter, and owing to the late period of the session when the legislature have heretofore made appropriations, the spring is far advanced before the supervisors can draw funds enough to pay their debts and proceed with their work; under such circumstances, it is impossible to have all the lines of canal well prepared for an early navigation in the spring.

Every effort has been made by the Board, consistently with the well being of the public works to husband the funds, but for three years past they and the supervisors have often been subjected to extreme embarrassments when the appropriation for repairs became exhausted. At such times, dams and other expensive improvements in progress have frequently been in an unfinished state. To abandon them in such a condition, would be to give up the whole system of improvement to ruin. And as there has been no power lodged in any department of the government to grant relief, it has often become necessary to appeal to the public spirit of the supervisors, to preserve the canals from destruction and the public from disappointment. It is but justice to those officers to state, that such appeals have seldom been made in vain. Many of them have with a laudable ambition, exerted themselves to the utmost, and exhausted their private credit, after their drafts ceased to be paid at the Treasury. But the evils are not confined to the agents of the state and the laborers who have to go without their wages; important works have to be postponed, and repairs done under the circumstances just mentioned, are always more costly to the commonwealth.

TOLLS.

The tolls paid into the Treasury in 1830, amounted to	$27,012 90
In 1831, there was paid in	38,241 20
And during the year ending on the 31st October 1832, there was paid in,	50,909 57
The tolls paid into the Treasury for the last year ending October 31, 1833, amount to	151,419 09

This sum of one hundred aud fifty-one thousand four hundred and nineteen dollars and sixty-nine cents, which has been received by the Treasurer within the last fiscal year, will probably be increased during the navigable season, to near two hundred thousand dollars.

It will be gratifying to the citizens of the commonwealth, to observe, that the tolls received in 1833, have trebled the amount received in 1832, and that too under many discouraging circumstances. There has been but a single line of boats regularly employed (one starting daily from each city) between Philadelphia and Pittsburg,

throughout the past season; and they only used one hundred and fifty-three miles of the Pennsylvania canal on the east side, and seventy-three miles on the west side of the mountain. The Susquehanna lines were not in full use until the twenty-fifth of July, and the navigation of the Delaware division was much interrupted by breaches.

As one hundred and eighteen miles of rail-road will be provided with a single track of rails, which can be used, and which will connect the unconnected links in the main line; as the old lines of canal are becoming more permanent and new lines will be added next spring. And as the slumbering spirit of the mercantile portion of the community is aroused to a proper apprehension of the importance of securing the immense trade of the "*great west*," the Canal Commissioners think they hazard but little in predicting that the amount of tolls which will be paid into the Treasury during the ensuing navigable season, will not be much, if any, short of half a million of dollars.

Tables are annexed to this report showing the amount of toll received by each collector within the past year, and also the tonnage, &c. conveyed upon the canal and rail-way as required by law.

NEW LINES.

Since the commencement of the improvement system of Pennsylvania, there has from time to time been introduced into the laws making appropriations, restrictions with a view of guarding against frauds and preventing abuses. Some of these prudential guards around the Treasury have produced evils which the Canal Commissioners consider it their duty to present to the Legislature for their consideration. And among these is the provision in the several acts passed within the last three years, for prosecuting the public works, which prohibits the Canal Board from incurring debts for the completion of new work under contract, on the faith of the State.

However wise and salutary such a prohibition may seem to be in *principle*, yet in practice it has delayed the completion of the canals and rail-ways, and greatly enhanced their cost. It is believed that the evils produced by this provision in the canal laws, are much greater than any that could have taken place without it. It is evidently the wish of the public and the interest of the State, that the improvements should be completed as soon as possible after they are commenced.

When an appropriation is exhausted the whole line is broken up. The retained per centage, which is designed as a security for the faithfulness of contractors, has to be paid to them. And those contractors who have unprofitable jobs are certain to abandon them. Labourers are scattered, and make engagements elsewhere; and they do not willingly return to a line where employment is so uncertain.

The laws making appropriations are always passed late in the session of the Legislature. After which the scattered corps of Engineers have to be collected and reorganized. Jobs have to be advertised and let—and contracts entered into. Contractors have to collect labourers, teams, provisions, &c.; by which the best season for doing

work is wasted, and of course their prices for the work must correspond with the disadvantages.

Every thing which encourages re-letting is most pernicious in its effects. It destroys the responsibility and laudable pride which good contractors take in completing their jobs faithfully. It encourages a spirit of speculation or gambling in chances. It covers such lines with many bad contractors, and it enhances the cost and delays the work unreasonably.

While the public works are constructing, they are subject to many casualties which cannot be foreseen or estimated; such as floods, quicksands, hill-slips, a rise in labour or provisions, and a difficulty in procuring materials: and as a necessary consequence, numerous re-lettings at much higher prices—by which the appropriation may be exhausted before the line is completed. A canal may be nearly ready to receive the water, when the remaining work undone must be suspended, and the completion and use of the line postponed until another season.

The evil effects of the restriction are still more obvious on the rail-roads. The iron rails, pins, and wedges, and a large proportion of the chairs have to be procured in England. And it has been found almost impossible to advertise for proposals—make contracts—send out orders—get the iron manufactured to pattern—have it imported and laid on the rail-way during the same season in which the law is passed making the appropriation.

The legal impediments which caution or perhaps prudence has thus erected in the path of the public agents, have delayed the completion of all the lines authorized by the act of the twenty-first of March, 1831, (except the Frankstown line of the Juniata division) for at least one year longer than was anticipated at their commencement; and, owing to causes just detailed, have greatly increased their expense. But while duty has enjoined a rigid compliance with legal requirements, however embarrassing they may have been, patience and perseverance have surmounted the numerous obstacles met with in the prosecution of the work; and it now only requires the efforts of another season, to finish all the canals and rail-roads of the State, which the laws at present authorize.

As soon after the passage of the act of the sixteenth of February, 1833, as was practicable, operations were recommenced on all the lines for which appropriations were made in that act; since which time, the works have been prosecuted steadily, and, upon several of the lines, with great zeal and energy towards completion. A more particular statement of the condition of each line, will be given under their respective heads.

COLUMBIA RAIL-WAY.

The Columbia rail-way is eighty-two miles long.—It was commenced in 1828, but owing to a want of appropriations, and various causes over which the Canal Commissioners had no control, the completion of it has been unreasonably delayed. They are now, however, enabled to inform the Legislature, that a single track over the whole

road, and the second track on twenty-two miles of the eastern end of it, will be laid and ready for use by the first day of January 1834, unless they are disappointed in receiving a quantity of iron that has been shipped in England and is daily expected at Philadelphia.

The jurisdiction of the superintendent who had charge of the eastern end of the road, was, within the last year, extended over the whole line; and as the engineer by whom the road was located, and under whose directions the construction of it had progressed until the date of the last report, has since then died, another engineer has been appointed, who took charge of the road on the first day of last March.

On the sixteenth of February, 1833, the act passed appropriating one million one hundred and eleven thousand nine hundred and fifty-eight dollars and seventy-eight cents, for prosecuting the work. Directions were immediately given by the Board, to the superintendent of the road, to enter into a contract or contracts for procuring iron, and on the fourteenth of March, orders were transmitted to England for rails, chairs, bolts and wedges for one track; and soon afterwards, orders were forwarded for iron for the second track on the sixty miles. To ensure its completion according to the patterns furnished, and of the quality required, and also to hasten its delivery, a special agent was sent to England by the Board, to inspect the iron when manufactured, previous to shipment. Before contracts could be made in England, the manufacturers of iron in that country had received very large orders, which rendered it impossible to get more iron prepared and shipped during the present season, than is sufficient for one track. The iron for the second track is now manufacturing, and will be delivered early next spring. If orders could have been transmitted for the iron in the beginning of last winter, the whole of it might have been received during the present season, and about twenty-four thousand dollars saved in its cost, as the price of iron in England had advanced, before the orders of the spring arrived.

The second track on the eastern twenty-two miles of the road was completed, and the connection between the West-Chester rail-way and Philadelphia established, last winter, except the large viaduct and road bridge over the Schuylkill at Peters' Island; which work has been delayed beyond the expectations of the Board, notwithstanding every effort has been used to urge it forward by the officers on the line, and a special inspector who was employed to superintend its construction. It is, however, at this time, in such a state of forwardness, that it will be ready for the rails by the middle of next December.

The grading and mechanical work belonging to the road bed formation, on the other sixty miles, including the great viaducts over Valley creek and West Brandywine, the deep cut at the gap, and the side road through the city of Lancaster, are so nearly finished, that in all the month of December next, rails may be laid upon the whole road.

The "deep cut," through a gap of the Mine ridge between Lancaster and Chester counties, has proved the most difficult job that has ever been undertaken on the public works of the State; for in all

other cases, skill and labour, time and perseverance, have vanquished the most formidable obstacles; but the deep cut, (which was originally designed to be about half a mile long, and thirty-seven feet deep, at the highest point, diminishing to common cutting at the ends,) has bid defiance to the skill of the engineer, and the laborious exertions of several contractors. After opening the ground a few feet from the surface, a quick-sand of the worst kind was encountered, that would have required at least two years to remove, at an unknown expenditure, but probably not less than two hundred thousand dollars.

The rail-way was graded up for several miles on each side of the gap, at the maximum of thirty feet rise to the mile. It was, therefore, with extreme reluctance, after a protracted effort to remove the quick-sand had failed, that the grade of the road was raised for three-fourths of a mile on each side of the summit, at the rate of forty-five feet per mile. The work is now progressing rapidly. The rails through the deep cut will rest upon firm piles driven through the quick-sand.

Steam engines are preparing for the two inclined planes. The one for the Columbia plane is nearly finished, and is estimated at forty horse power; and the one at the Schuylkill plane, of sixty horse power, is now setting up. The engine houses have each been constructed for receiving a second engine, whenever the trade may require it. It is computed that nineteen hundred and twenty tons may be passed over each of the planes, in a day of 12 hours.

In the report of the Canal Commissioners of November first, 1832, they say, that "with a view to hasten the completion of a line between Philadelphia, the Susquehanna and the West, it is contemplated to lay one track, from the western termination of the twenty-two miles to Columbia, upon wooden sills." The act of the sixteenth of February, 1833, making a further appropriation of one million, one hundred and eleven thousand, nine hundred and fifty-eight dollars and seventy-eight cents, towards completing the Columbia rail-way, requires iron edge rails to be used. This sum is one hundred and twenty-six thousand, four hundred and fifty-six dollars and sixty-three cents *less* than the estimate of Major Wilson, for finishing the road with one track, laid with flat bars on wooden rails; and it is four hundred and thirty-four thousand, three hundred and sixty-one dollars and thirty-two cents *less* than his estimate, if both tracks should be laid with iron edge rails.

By the estimate of Mr. Gay, the present engineer, and the report of the superintendent, it appears that a further appropriation of eight hundred and four thousand, eight hundred and ninety-five dollars and fifty-eight cents, will be required to complete the road for locomotive engines alone; or eight hundred and eighty-nine thousand, eight hundred and ninety-five dollars and fifty-eight cents, if the road is prepared for using horses. Hence the estimate of the present year, (if locomotive engines are alone used on the road,) will exceed that of last year by the sum of three hundred and seventy thousand, five hundred and thirty-four dollars and twenty-six cents.

This large excess is accounted for—

1st. By greater strength and solidity given to the whole work, and especially to the large viaducts.

2d. By the difference in the weight of the rails.

3d. By locomotive engines, water stations, and other things estimated by Mr. Gay, that do not appear in the estimate of Major Wilson.

4th. By an almost total failure in procuring stone blocks in the lime stone valleys through which the road passes. And having to haul two thousand three hundred tons of stone blocks from the sand stone hills, a distance of from twelve to twenty miles to the road. This circumstance alone caused two-thirds of the contractors to abandon their jobs.

5th. By an unusual number of re-lettings at higher prices.

6th. By the unforeseen difficulties of the deep cut at the gap at Henderson's.

7th. By the enhanced price of iron in England.

8th. By the connection of the rail-road with the Columbia bridge, required by a resolution of the Legislature of the twenty-sixth March, 1833, and other work not contemplated at the previous estimate.

The *Wiggan rail*, weighing forty-one and a fourth pounds per yard, has been adopted for both tracks of the sixty miles now in progress. It is calculated for carrying locomotive engines weighing six tons. Locomotive engines may run from Philadelphia to Columbia on the first track, in the month of January next, if the iron arrives which is expected. And the second track can be finished by the first of September, 1834.

A survey and estimate have been made, and arrangements are making, in obedience to the resolution of the Legislature of the twenty-sixth March, 1833, for placing under contract the work for connecting the Columbia rail-way with the tracks to be laid upon the Columbia bridge.

STATEMENT OF THE FUNDS APPROPRIATED TO THE COLUMBIA RAIL-WAY.

Amount available of appropriations of 1831 and 1832,		$1,238,431 14
Pro rata deduction under act eleventh June, 1832, refunded,		51,710 44
Appropriation of the sixteenth February, 1833,		1,111,958 78
		$2,402,100 36
Disbursed in 1831,	210,704 23	
do. 1832,	764,887 49	
do. 1833, Mitchell,	664,539 70	
do. do. Barber,	60,667 57	
		1,700,798 99
Balance on hand, October thirty-one, 1833		$701,301 37

Due for per centage retained,	50,004 95	
Estimate of work required to complete both tracks,	1,450,542	
Cost of connecting with the Columbia bridge,	5,650	
		1,506,196 95
Deduct above balance,		701,301 37
		$804,895 58
To which must be added $85,000 for horse paths, if horses are to be used, or if locomotive engines are used there must be added,		51,000
		$855,895 58
Whole amount disbursed prior to 1831,	337,863 04	
Amount disbursed as above stated,	1,700,798 99	
Per centage due and work to be done,	1,506,146 95	
	3,544,808 98	
For locomotive engines,	51,000	
Cost when completed for locomotive engines,	$3,595,808 98	

Length including the side road through Lancaster, 82 miles.

PORTAGE RAIL-WAY.

The Portage rail-road over the Allegheny Mountain, is thirty-six miles and two hundred and eight perches long, but between the extreme points of navigation is only thirty-six miles, and it overcomes a rise and fall of two thousand five hundred and seventy feet in that distance. The work upon this road has within the past year progressed very well, the grading and masonry are completed. A single track of rails along the whole road and a double track on the inclined planes (making together forty-four miles and three hundred and fourteen perches,) are almost finished.

Ten steam engines have been constructed, and are putting up at the ten inclined planes, four of them are estimated at thirty horse power, and the other six at thirty-five horse power each. They are made on the high pressure principle and, may, if the trade require it be worked up to forty, fifty or sixty horse power with safety, lest, however, accidents and consequent delays should occur, it is intended when the second track of rails is laid, to put up a second engine at each of the planes.

As a precautionary measure two extra ropes have been procured. The ropes are what are called "white ropes," made of Russian and Italian hemp, from six and one fourth to seven inches in circumference. The aggregate length of the twelve ropes is eleven miles and seven hundred and seventy-eight yards. Their whole weight is one hundred and eighteen thousand, six hundred and forty-nine pounds,

and they cost from fourteen to eighteen cents per pound; or altogether when delivered at Hollidaysburg, twenty thousand five hundred and thirty-one dollars and five cents. It is calculated that the engines and ropes when working at an ordinary rate will take a train of cars up the planes, at a speed of four miles an hour; and at the same time a train can descend the plane.

The completion of the rail-road has been retarded by delays in the importation of iron, two thousand one hundred and ninety-three tons of malleable iron rails, and one hundred and twenty-three thousand, six hundred chairs of cast iron were required for a double track on the inclined planes; and a single track throughout the rest of the road. About two-thirds of the chairs were manufactured in our own state; and the residue of the iron was obtained in England. Of seven ships that were freighted with iron in 1832, but two arrived in a reasonable time. One ship was lost altogether, and one was six months at sea. The insurers had to pay about fifteen thousand dollars for iron that was lost, and twenty-two thousand and thirty-seven chairs that arrived were condemned at a loss to the manufacturer. Hence orders had to be sent out last spring to England to supply the deficiency.

The iron obtained in England, cost			$192,644	00
The castings made at home, cost			58,134	26
Whole cost of iron			$250,778	26
	Miles.	Yards.	Miles.	Yards.
The length of road with edge rails on stone blocks is	13	1591½		
Ditto on timber, is	20	1120		
			34	951½
Plate rail on timber,			10	775
Length of single track,			44	1726½

In the construction of the Portage rail-road, a large amount of heavy work has been performed, deep excavations, large embankments, and very high and strong outside supporting walls, as well as numerous drains, culverts and viaducts, all of solid masonry have been executed, of which work, the great viaduct of cut stone with a semi circular arch of eighty feet span over the Little Conemaugh at the horse shoe bend, and the tunnel of nine hundred feet long through a spur of the mountain, will demand, and must receive, from the public unqualified admiration for the boldness of their design, and the strength and beauty of their execution.

It is believed to be unnecessary to adduce arguments for proving the utility and necessity of a second track of rails on this road, to accommodate the incalculable amount of trade that will pass between the basin of the Mississippi valley, and the sea board within a few years after the public works of the state are finished; should the legislature invest the Canal Commissioners with power to enter into contracts for iron, the second track of the rail-way may be completed over the mountain in three months after the iron is delivered.

STATEMENT OF THE FUNDS APPROPRIATED TO THE PORTAGE RAIL-WAY.

Amount available of the appropriations of 1831 and 1832,		$760,418 60
Pro rata deduction under act eleventh June, 1832, refunded,		39,581 40
Appropriation of the sixteenth February 1833,		414,793 06
		$1,214,793 06
Disbursed in 1831,	$71,146 64	
1832,	401,335 72	
1833,	568,639 19	
		$1,041,121 55
Balance on hand thirty-first October, 1833,		173,671 51
The estimated cost of work to be done to complete the first track including the incidental expenses and retained per centage,		$213,940 01
Deduct the above balance,		173,671 51
Amount required to complete first track,		$40,268 50
The whole amount paid, is		$1,041,121 55
Per centage retained and work to be done,		213,940 01
Whole cost of single track, is		$1,255,061 56

which includes a double track on the inclined planes making altogether forty-five miles of single track.

Length of Portage rail-way, is thirty-six miles and two hundred and twenty-one perches.

The estimated cost of completing the second track, is	$325,577 85
Amount required to complete the first track,	40,268 50
Amount required to complete the Portage rail-way,	$365,846 35

USE OF THE RAIL-WAYS.

A very important question for Legislative decision has arisen respecting the proper manner of using the rail-roads when they are finished. And as their profitable use next spring demands an immediate determination of the mode by which transportation on them shall be conducted, the Board respectfully request the early attention of the Legislature to the subject, and submit the following methods for their consideration.

1. To establish the rail-roads as public high ways, for the use of every person who may choose to employ either horses or locomotive engines.

2. To prohibit the use of locomotive engines altogether, and make the roads public high ways for the use of every person who will employ horses alone as the motive power.

3. To prohibit the use of horses altogether on such parts of the roads as can be advantageously traversed by locomotive engines, and make them public high ways for the use of every person who will employ locomotive engines alone as the motive power.

In either of the three preceding cases, in which the rail-roads would be declared public high ways, the Commonwealth must maintain and employ the stationary steam engines and ropes at the inclined planes, or lease them for a term of years to individuals or companies.

4. To lease the roads and transportation to a company or companies for a term of years, binding them to preserve the roads and machinery in good order.

5. To lease the transportation alone to a company or companies, for a term of years, and the Commonwealth to maintain the roads and machinery in repair.

6. To lease the right of *traction* or *motive power* only, to a company or companies for a term of years, binding them to transport such cars with their freight as may be offered by individuals or companies, and the Commonwealth to maintain the roads and machinery in repair.

In either of the last three cases of leasing the *roads*, the *transportation*, or the *traction*, the stationary steam engines and ropes at the inclined planes may be maintained and employed by the Commonwealth, or they may be let out on leases for a term of years to individuals or companies.

7. The Commonwealth to furnish the traction or motive power, own the cars, and do all the transportation on the rail-road.

8. The Commonwealth to furnish the traction or motive power only, and transport such cars, with their freight, as may be offered by individuals or companies.

In the event of it being settled that the Commonwealth will furnish the motive power on the rail-roads, it is still necessary for the Legislature to determine whether the Columbia rail-way shall be finished for using horses on it, or for using locomotive engines, or for the use of both modes of conveyance.

For more comprehensive views of this subject, the Board respectfully refer to the reports of the superintendents and engineers on the two rail-roads, accompanying this report.

Before quitting the subject of the rail-roads of the State, the Board wish to call the attention of the Legislature, to a necessity that exists for a law, with suitable penalties, to preserve those splendid monuments of the power, enterprize and perseverance of Pennsylvania from destruction, similar to the law now in force for the protection of the canal.

BEAVER DIVISION.

The Beaver division of the Pennsylvania canal, commences on the Ohio river twenty-eight miles below Pittsburg, and is located from the mouth of the "Big Beaver creek," or rather river, up that stream and Shenango creek thirty miles and two hundred and forty perches, ter-

minating in Mercer county. It has eight miles and one hundred perches of canal, and twenty-two miles and one hundred and forty perches of slackwater, made by seven dams.—There will be eighteen lift and guard locks on this line, which, for size and quality of stone, and for solidity and beauty of masonry, are not surpassed by any locks that the Board have ever seen.

This line has progressed steadily since the appropriation of the sixteenth of February last, and it is expected that, from New Castle to Beaver, the canal will be ready for navigation before the setting in of winter.

By the act of the twenty-seventh March, 1833, the Canal Commissioners were required to have a towing path constructed along the pool of the dam in Shenango creek, six miles of which were put under contract, and the grubbing on it has been done: but for want of funds, this towing path, and the dam in the Shenango, and also a guard lock at New Castle and all the lock houses, had to be suspended.

The additional appropriation required to complete the Beaver division, arises from the Shenango towing-path, the guard lock at New Castle, and other indispensible work on the line not embraced in last year's estimate; also from an increased expense in removing quicksands and hill slips, and in repairing damages done by a flood in September last, which seriously injured two dams, and partially injured some other works, which, at the time, were in an unfinished and unprotected condition.

The suspended work can all be completed during the next season.

STATEMENT OF THE FUNDS APPROPRIATED TO THE BEAVER DIVISION.

Amount available of appropriations of 1831 and 1832,		$222,421 26
Pro rata deduction under act of 11th June, 1832, refunded,		4,660 39
Appropriation of the 16th February, 1833,		197,159 97
		$424,241 62
Disbursed in 1831,	39,926 66	
Do in 1832,	177,617 95	
Do in 1833,	147,519 10	
		365,063 71
Balance on the 31st October, 1833,		$59,177 91
There is due upon this division, for per centage retained on work done,	19,149 86	
Estimated cost of work to be done, is	97,069 41	
		116,219 27
Deduct the above balance of		59,177 91
Amount required to complete the division, including the Shenango towing path,		$57,041 36

The whole amount paid upon this division, is	365,063 71
Per centage retained, and work to be done, is	116,219 27
Whole cost, when completed,	$481,282 98

The length of the division, including the Shenango towing path, is thirty miles, and two hundred and forty perches.

FRENCH CREEK DIVISION.

The French Creek division has been prosecuted with spirit, since the appropriation of last spring enabled the contractors to proceed with their work, and twenty-two and a fourth miles of it are nearly ready for navigation. This division of the public improvements, commences on the Allegheny river, near the borough of Franklin, ninety-three miles above the mouth of the Kiskiminetas, or main line of the Pennsylvania canal; and it is carried up French Creek twenty-two and a fourth miles, to the "feeder," from whence the feeder forms the continuation of the canal, *up* which the right branch proceeds eleven miles, and the left branch *down* the feeder twelve and a half miles, to Conneaut lake. The whole division is forty-five miles and two hundred and sixty-four perches long, of which about twenty-seven and a fourth miles is canal, and eighteen and a half miles is slackwater; and, with the Conneaut lake, will give about fifty miles of navigation. There are twelve dams, and eighteen lift and guard-locks, on the line.

The last year's appropriation to this division is exhausted; and a dam near the head of the feeder, a towing path along the pool of the dam, and many other jobs of work on the division, have been suspended until another season, for want of funds.

The increased expense of the line over last year's estimate, is owing to an inadvertant omission in providing for contingent expenses; to several new works having been added; to damages done by a flood in September last, and other unforeseen difficulties in construction; to additional strength given to the work; and above all, to re-lettings, by which a large amount of work advanced in price forty per cent. over the contract prices of last year.

The main stem of the division will be navigable next spring; and the suspended work may be completed, and the feeder also put in good order for navigation, by the first of September, 1834.

STATEMENT OF THE FUNDS APPROPRIATED TO THE FRANKLIN LINE AND NORTH AND WEST ENDS OF THE FEEDER.

Amount available of appropriations of 1831 and 1832,		$181,145 39
Pro rata deduction under act of eleventh June 1832, refunded,		4,022 92
Appropriation of the sixteenth February, 1833,		162,991 98
		$348,160 29
Disbursed in 1831,	20,798 44	
1832,	88,906 84	
1833,	193,078 65	
		302,783 93
Balance on hand October thirty-one 1833,		$45,376 36

There is due on this line for per centage retained,	31,979 54	
Estimated cost of completing the work,	107,794 87	
		$139,774 41
Deduct the above balance,		45,376 36
Amount required to complete the work,		$94,398 05
The whole amount paid, is		302,783 93
Per centage retained and work to be done,		139,774 41
Whole cost of the Franklin line and north and west ends of feeder,		$442,558 34
		Miles. Perches.
Length of the Franklin line is		22 80
North and west ends of the feeder,		4 24
		Miles, 26 104

WYOMING LINE OF THE NORTH BRANCH DIVISION.

At the date of the last report, it was expected that by this time we could announce the completion of this line, which with its feeder, is seventeen miles and two hundred and thirteen perches long, with forty-three feet of lockage, but that expectation has been disappointed in consequence of a scarcity of labourers.

There are on this line, several sections requiring either deep excavation through rock, or heavy outside protection walls to be built, and consequently a large force was necessary on those jobs, that could not be obtained in that neighbourhood. Much difficulty was experienced in sinking the pit and getting in the foundation of an outlet lock at the mouth of Solomon's creek, and the site of the feeder dam in the Lackawanna creek had to be changed, on account of a quicksand. These several obstacles are nearly surmounted, and it is believed that the canal will be ready for navigation early next spring.

STATEMENT OF THE FUNDS APPROPRIATED TO THE WYOMING LINE.

Amount available of appropriations for 1831 and 1832,		$167,136 76
Pro rata deduction under the act of eleventh June 1832, refunded,		2,553 63
Appropriation of the sixteenth February 1833,		115,202 46
		$284,892 85
Disbursed in 1831,	29,038 15	
1832,	106,357 66	
1833,	91,645 37	
		227,041 18
Balance on hand October thirty-one, 1833,		$57,851 67

There is due, for retained per centage,	12,488 16	
Estimated cost of work to be done,	62,705 09	
		75,193 25
Deduct the above balance,		57,851 67
Amount required to complete the line,		$17,341 58
The whole amount paid, is		227,041 18
Amount required,		75,193 25
Whole cost when completed,		$302,234 43

Whole length of the line is seventeen miles and two hundred and thirteen perches.

LYCOMING LINE OF THE WEST BRANCH DIVISION.

The West Branch division of the Pennsylvania canal, extends from the junction with the Susquehanna and North Branch divisions at Northumberland, seventy-two miles, to the base of the Allegheny mountain, and with the Lewisburg and Bald Eagle side cuts, will give seventy-six and one-fourth miles of navigation. The first twenty-four miles of the division are called the *Muncy Line*, and the upper forty-seven and a half miles, the *Lycoming Line*. Twenty-six and a half miles are navigable; forty-five and three-fourths miles (including the two side cuts) are under contract, and four miles of towing-path along the pool of the feeder dam, are not under contract.

The LEWISBURG SIDE CUT, which is two hundred perches long, branches from the Muncy line six miles above Northumberland. It has a dam in the West Branch, two and a half feet high, and three lift locks, overcoming twenty-one feet of lockage. This short but useful inlet to the canal, is completed, except a small towing-path bridge and a lock-house.

The LYCOMING LINE, as originally planned in 1831, for the purpose of creating slackwater, was to have six dams in the river, embracing a large one at the head of the line located opposite the Great Island. Early in 1832, before any work was done at the dams, they were suspended, and an independent canal was substituted instead of slackwater; and subsequently, a feeder was located, to be taken from the river at Smith's ripples, which was four miles and fifty-six perches long; but as another site for building a feeder dam presented itself, near Dunnstown, two miles and two hundred and sixteen perches below Smith's ripples, the question of a final location was left open for further examination, and only one and a half miles of the feeder, at its lower end, was put under contract.

Such was the situation of this part of the line, at the date of our last report: Further examinations were made last winter and spring, which resulted in a conviction, that the site for a feeder dam at Dunnstown was, in many respects, much more eligible than the one at Smith's ripples. At the latter place, the river is very narrow, and the dam would rest on a gravel bottom; both of which circumstances are decidedly objectionable: while at the former place, the river is wide, and

a part of its bottom is solid rock. Another important consideration was, that the Dunnstown site would insure a better supply of water on the lower levels, by shortening the length of feeder. The difficulties that had been experienced by the river trade, at the chutes of the Muncy, Shamokin, and Nanticoke dams, made the Board anxious to have the one at the feeder dam constructed in the best manner, which could be done with entire safety to the descending river trade on the smooth solid rock at Dunnstown, but could not be done with so much certainty on the gravel bottom at Smith's ripples. These reasons, of themselves sufficient to convince the Board of the superiority of the Dunnstown site for the dam, were still further strengthened by a comparative estimate of the engineer, which proved that twenty-seven thousand nine hundred and two dollars and forty-three cents, would be saved by its adoption.

The feeder dam is eight hundred and fifty-two feet long and eleven and a half feet high above low water mark. It is built of crib work, filled with stone, and has a base of seventy-eight feet and fifty feet of gravelling, thus making the entire base of the dam one hundred and twenty-eight feet. The chute is twelve hundred and eight feet long and thirty feet wide, constructed in the most substantial manner. The dam and chute will both be completed by the first day of next January.

The feeder dam affords slackwater to the vicinity of the bituminous coal region, where large preparations are now making for the transportation of that mineral upon the canal. It is estimated that thirty-three thousand nine hundred and eighty-one dollars, would be sufficient to construct a towing-path along the slackwater of this dam. This would add four miles to the navigation, and be greatly to the advantage of the coal trade. This sum of thirty-three thousand nine hundred and eighty-one dollars is not included in the estimate for completing the Lycoming line.

The engineer of the line was directed to make a survey and an estimate of the cost of connecting the Lycoming line with the Bald Eagle creek, at its mouth, and also to connect the creek and the canal above the Great Island. The latter connection was found to be the cheapest, and it possessed many advantages over the former, which induced the Board to adopt the present location and put the work under contract. It is nearly completed. This side cut commences in Centre county, by a dam four and a half feet high in the Bald Eagle creek, where there is also a guard lock, and it terminates in the pool of the feeder dam, by a lock of eight feet lift. It is three miles and two hundred and eight perches long, and will be an invaluable improvement.

There are fourteen guard and lift locks, overcoming ninety feet of lockage, between the pool of Muncy dam and the head of the Bald Eagle side cut, and seven aqueducts, the aggregate length of their trunks is one thousand and forty-two feet.

Although the country through which the Lycoming line passes, is generally favorable for the construction of the canal, yet there are

many heavy and expensive jobs on the line, such as dams, chutes, aqueducts, deep excavations, rocky bluffs and high protection walls; and the scarcity and difficulty of procuring good stone for masonry has greatly increased the cost of the work.

The Lycoming line, in common with all the branch lines, has been greatly delayed for want of adequate appropriations, but during the past season the work on it has generally been prosecuted with diligence. A greater scarcity of mechanics was experienced on this line, than on any other portion of the public works. These causes have produced the common complaints of a perpetual succession of re-lettings, at higher prices. To this cause may principally be ascribed the enhanced cost of the line: but the increase of this year's estimate over that of last year, is also partly owing to the works having been greatly strengthened, and the Bald Eagle side cut not being included in last year's estimate.

From Loyalsock feeder downwards, about fourteen miles may be finished by the first of July, and the remainder of the line can be completed by the first of September, 1834.

STATEMENT OF THE FUNDS OF THE LYCOMING LINE AND LEWISBURG AND BALD EAGLE SIDE CUTS.

Amount available of appropriations of 1831 and 1832,		$380,784 40
Pro rata deduction, under act of eleventh June 1832, refunded,		6,639 46
Appropriation of the sixteenth February 1833,		470,007 90
		$857 431 76
Disbursed in 1831,	60,752 89	
1832,	174,688 84	
1833,	470,567 24	
		706,008 47
Balance on hand, October thirty-one 1833,		$151,423 29
There is due on this line for per centage,	61,300 97	
Estimated cost of completing the work,	391,271 40	
		$452,572 37
Deduct the above balance,		151,423 29
Amount required to complete the division,		$301,149 08
Whole amount paid, is		706,008 47
Per centage retained and work to be done,		452,572 37
Cost when completed,		$1,158,580 84

	Miles.	Perches.
Length of Lycoming line,	41	258
Bald Eagle side cut,	3	208
Lewisburg side cut,		200
Whole length,	Miles 46	26

The COLUMBIA LINE of the Eastern division, and the FRANKSTOWN LINE of the Juniata division were both filled with water last fall, subsequently to the date of our last report. A number of jobs on those lines, which at that time were in progress have been completed. Several contracts on the Columbia line are yet unfinished. The following is a statement of the funds appropriated to those lines and of their cost.

STATEMENT OF THE FUNDS APPROPRIATED TO 8 MILES AND 227 PERCHES OF THE COLUMBIA LINE OF THE EASTERN DIVISION.

Amount available of appropriations of 1831 and 1832,		$127,445 69
Pro rata deduction under act of eleventh June 1832, refunded,		2,469 36
Appropriation of the sixteenth February 1833,		35,835 25
		$165,750 30
Disbursed in 1831,	$7,491 98	
1832,	77,871 24	
1833,	35,226 28	
		150,589 50
Balance on hand October thirty-one 1833,		$15,160 80
Per centage retained, and estimated cost of completing the work,		15,100
Excess of appropriation,		$60 80
The whole amount paid, is		150,589 50
Per centage retained and work to be done,		15,100
Whole cost of eight miles and two hundred and twenty-seven perches,		$165,689 50

A STATEMENT OF THE FUNDS APPROPRIATED TO THE FRANKSTOWN LINE.

Amount available of appropriations of 1831 and 1832,		$724,129 59
Pro rata deduction under the act of eleventh June 1832, refunded,		24,259 56
Appropriation of the sixteenth February 1833,		32,712 14
		$781,101 29
Disbursed in 1831,	79,325 38	
1832,	556,980 31	
1833,	125,453 09	
		$761,758 78
Balance on hand thirty-first October 1833,		$19,342 51
Estimated cost of completing the line,		18,999 92
Excess of appropriations,		$342 59

The whole amount paid, is	761,758 78
Amount yet to pay,	18,999 92
Whole cost of the Frankstown line,	$780,758 70

	Miles.	Perches.
Length of the Frankstown line,	38	154
South Branch feeder,	3	40
Whole length,	Miles, 41	194

DAMAGES.

The following sums have been paid within the last year, upon the several divisions, for damages:

Columbia rail-way,	$8,152
Western division,	9,919 50
Beaver division,	133 68
French creek feeder,	122 25
North Branch division,	16,726 80
Susquehanna division,	1,870 91
West Branch division,	5,595
Juniata division,	17,517 96
Eastern division,	1,050
Delaware division,	11,156
	$72,244 10

The counsel for the Commonwealth were directed by the Board, previous to the argument of the causes pending in the Supreme court for damages upon the Eastern division, to offer to the respective claimants, as a compromise, the same sums which had been offered to them by the resolution of the Board of the twenty-fifth of September, 1830. Offers of compromise were also directed to be made, with one exception, to the other claimants, in causes pending in the Supreme court at Lancaster and at Sunbury. The offers of compromise made, in the causes pending at Sunbury, were accepted; they have since been paid, and satisfaction is entered. Neither of the offers of compromise, to claimants upon the Eastern division, were accepted. The causes were argued before the Supreme court at Lancaster, in May last. Four of the seventeen have been decided in favour of the Commonwealth, and the others are still pending.

A STATEMENT OF THE SUMS APPROPRIATED AND APPLICABLE TO THE NEW LINES, AND OF THE SUMS REQUIRED TO COMPLETE THE SAME.

	Sums appropriated.	Sums required.
Columbia rail-way,	$2,402,100 36	$804,895 58
Portage rail-way,	1,214,793 06	565,846 35
Beaver division & Shenango towing-path,	424,241 62	57,041 36
Franklin line & north & west ends feeder,	548,160 29	94,398 05
Wyoming line and Lackawanna feeder,	284,892 85	17,341 58
Lycoming line and Lewisburg and Bald Eagle side cuts,	857,431 76	301,149 08
Frankstown line & South Branch feeder,	781,101 29	
Columbia line, 8 miles 227 perches,	165,750 30	
Sum required to complete,		$1,640,672 06
There will be required for new work upon old lines, and for the purchase of lots for houses and offices for collectors and lock keepers, and to pay debts due,		100,000
To pay debts due by supervisors for labor and materials,	64,298 58	
For repairs the ensuing year,	410,701 42	
		475,000
To pay damages,		49,328
Amounting to,		$2,265,000

The estimate of the expenses of the engines, &c. at the inclined planes upon the Portage rail-way, is for the next year,	$41,566 50
For expenses of horses, if horses are used as the motive power on the levels between the inclined planes,	18,732 50
For expenses of engines, &c. at the inclined planes, upon the Colmbia rail-way,	10,000
Six locomotive engines for the Columbia rail-way, watering places, depots, workshops, &c. are estimated at,	51,000

No estimate has been made of the expense of working the locomotive engines.

Before closing this report, the Board wish to call the attention of the Legislature to the propriety of authorizing the construction of locks, to connect the Susquehanna river with the canal at Ritner's, on the Susquehanna division, so as to afford an inlet to the coal that is carried on the Lykens Valley rail-way; and on the Columbia line, opposite to the works of the Codorus Navigation Company, that a large portion of the citizens of York county may participate more fully in the benefits of the State improvement; and also at Harrisburg, for the convenience of the citizens of Cumberland county.

The legislative provisons in relation to the Columbia, Chicques and

Marietta road, the road on sections eighty-eight and eighty-nine of the North Branch division, and the abutments of the French creek feeder dam at Bemus' mill, have been severally acted on by the Board.

The examination and survey of the damages sustained by the owners of private property, by the construction of the tunnel through Grant's Hill, in the city of Pittsburg, has been made, as directed by the resolution of the eighth of April last, and will be the subject of a special report.

Signed, by order of the Board,

JAMES CLARKE, *President.*

FRANCIS R. SHUNK, *Secretary.*

Harrisburg, November 1, 1833.

STATEMENT OF THE PROPERTY CONVEYED ON THE PENNSYLVANIA CANAL AND RAIL-WAY DURING THE YEAR ENDING ON 31st OCTOBER 1833.

COLLECTORS' OFFICES.	Flour. Barrels.	Wheat. Bushels.	Rye, Corn, &c. Bushels.	Grass Seeds. Bushels.	Potatoes. Bushels.	Beef & Pork. Barrels.	Fish. Barrels.	Butter, Cheese. Pounds.
Philadelphia,								
Portsmouth,							8373	
Harrisburg,							7273	
Lewistown,	3		80				475	
Huntingdon,	123		1498				855	262
Conemaugh,	5		701					
Blairsville,	8		5		2		1	1105
Leechburg,			396					1000
Northumberland,							2015	
Berwick,	1220		3152			16	200	
Bristol,					11	87	3617	14575
New Hope,							7	
North and West,	1,359		5,832		141	103	22,830	16,942
Portsmouth,	1881	2816					536	
Harrisburg,	6939	73120	36560	1270				
Lewistown,	12541	36067	1,79	150		55		22769
Huntingdon,	8541	6648	2111	603		269	66	30703
Hollidaysburg,	584				4		63	13724
Blairsville,	610		7313		195		18	123
Leechburg,	2	125	519				2	
Pittsburg,	4181		753		536		564	63179
Northumberland,	8992	31100	11900	900				10212
Berwick,	32	258			240			21150
New Hope,	2463	1002	500			29		1114
Easton,	24263	3589	38178		215			36327
South and East,	71,029	154,725	115,626	2,925	1,190	353	1,249	291,211

COLLECTORS' OFFICES.	Lard & Tallow	Salt.	Provisions.	Wool.	Cotton.	Hemp.	Tobacco.	Leather,&	Furs, &c.
	Pounds.	Bushels.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
Philadelphia,			1350						
Portsmouth,		39294	9184					409084	
Harrisburg,		25548		3920				454972	
Lewistown,		1357	20645					4795	
Huntingdon,	240	839						16340	
Conemaugh,		54						500	
Blairsville,			9196	224				12024	
Leechburg,		288784		150					
Northumberland,		15040						22048	124
Berwick,		321	32673				955	2746	
Bristol,	8328	24042	26337		36787	12353	53382	96117	
New-Hope,		45							
North & West,	8,568	395,324	169,385	4,294	36,787	12,353	54,287	1,018,576	124
Portsmouth,		918						8696	
Harrisburg,								210108	
Lewistown,			236470					19526	
Huntingdon,	2824	155	14349	3934		2352		21378	560
Hollidaysburg,		6295	180538	166764	23608	2632	170749	1987	
Blairsvile,		35929	207853				350	1742	
Leechburg,		390		500					
Pittsburg,	16083		234238	136690	23806	30070	213491	17857	
Northumberland,			71644					9344	
Berwick,		357	366					1000	
New-Hope,									
Easton,			491692	2110		3382		66158	
South & East,	18,907	44,039	1,437,145	309,998	47,414	38,436	384,590	352,796	560

COLLECTORS' OFFICES.	Whiskey Gallons	Domestic Spts. Gallons	For. Liquor Gallons	Merchandize Pounds	Oil Gallons	Gypsum Tons	Furniture Pounds	Window Glass Boxes	Rags Pounds
Philadelphia,	128			5200		2		1	
Portsmouth,				9724271	9756	5708	113141		
Harrisburg,				7193137	6766	3414	196990		
Lewistown,	1605			590461		465	53386		
Huntingdon,	132		1716	551388	98	406	49804		
Conemaugh,				5576			3376		
Blairsville,	528		11769	4618807	2652		114010		
Leechburg,				4760			3102		500
Northumberland,				2913439		1352	18576		
Berwick,	3881		764	89606	92	30	8433		
Bristol,		11818	36195	3853478	8071	3479	26555	360	
New-Hope,				108385		95	650		
North & West,	6,274	11,818	50,444	29,658,508	27,435	14,951	615,943	361	500
Portsmouth,				120795		475	7628		
Harrisburg,	62219	1683			2?		84836		
Lewistown,	11244			27256	120	2	20984		
Huntingdon,	3791	66		13608		3	43956	12	11383
Hollidaysburg,	12322		32	59492	407		11571	368	93705
Blairsville,	5672		231	30993			4255		
Leechburg,	660			839			18940		
Pittsburg,	64138		9551	762944	10252		46819	970	89245
Northumberland,	33657				16		9287	270	2971
Berwick,	891			1344		18	13511		
New-Hope,									
Easton,	89265				8505		19866	72	8809
South & East,	283,859	1,749	9,814	1,017,271	19,300	498	281,653	1,692	206,113

COLLECTORS' OFFICES.	Mineral Coal. Tons.	Iron. Pounds.	Lead. Pounds.	Copper & Tin. Pounds.	Marble. Pounds.	Lime. Bushels.	Limestone. Perches.	Slate for roof. Pounds.	Bricks. Thousand.
Philadelphia,	5	364814		600				13440	
Portsmouth,	45	4074550			46959				
Harrisburg,	31	2346039			112503		227		111
Lewistown,	78	662365							
Huntingdon,		593529		762	2321				1
Conemaugh,		1447779				14281			
Blairsville,	353	10132666		563		865			3
Leechburg,	10	297390							
Northumberland,					13580				8
Berwick,		55285		370	4000	13570	87		
Bristol,	10	602464		1145	1504	4567			3
New Hope,		4220							
North and West,	532	20,581,101		8511	280,867	33,283	314	13,440	126
Portsmouth,	539	1596044					646		12
Harrisburg,	1867	2436536							52
Lewistown,	70	2937879							41
Huntingdon,	30	139930		1096	400				
Hollidaysburg,	443	90738							6
Blairsville,	13	400842	60	404		9			
Leechburg,		11222				1020			
Pittsburg,	16	1462967	8559	3207					255
Northumberland,	4402	417716		100					
Berwick,	4212								
New hope,	7090						440		
Easton,	81124	294353				2351	85	1,137,198	
South and East,	99,806	9,788,227	8619	9,807	400	3,380	1,171	1,137,198	366

STATEMENT—CONTINUED.

COLLECTORS' OFFICES.	Timber Feet	Sawed lumber Feet	Staves, Heading & Hoop poles Pounds	Shingles Thousand	Post & Rails Hundred	Wood for Fuel Cords	Bark Cords	Sundries Pounds
Philadelphia,		6178		10		2		2776840
Portsmouth,		2030604		388	118	16		418010
Harrisburg,		24672				118		943946
Lewistown,		5851						213705
Huntingdon,	1800	74308			19	47	15	296746
Conemaugh,		19219						7050
Blairsville,		85607	5000	79	6	5		1751320
Leechburg,			16800		14		5	19530
Northumberland,								422000
Berwick,								77357
Bristol,	466679	40350	68088	20				1190068
New-Hope.								201261
North & West,	468479	2,286,784	90,488	497	157	188	20	8,317,838
Portsmouth,		702567	4480	141610	63		52	337045
Harrisburg,	2000	1042702	445794	279	94	1679	198	146148
Lewistown,		55820			19	106		48985
Huntingdon,	850	42460	36350	9	350		14	146146
Hollidaysburg,	2538	17191	152143	48	15			164077
Blairsville,		18436		54	6			1970235
Leechburg,		114991		196				5450
Pittsburg,		88774	161500	85	7	680	384	1852401
Northumberland,	5307	162915		150	7	20	5	70339
Berwick,		8600	58500	39		5		21486
New-Hope,		115086				6	61	4345257
Easton,		137300		13				7830185
South & East,	10,685	2,566,782	838,707	142,485	561	2,496	714	16,432,754

A GENERAL STATEMENT,

Showing the amount of tolls received, number of boats cleared, and quantity of tonage cleared, at the several collectors' offices; and the number of miles travelled by passengers on the Pennsylvania canal and rail-way, during the year ending on the thirty-first of October 1833.

PLACE OF COLLECTION.	Tolls paid into the Treasury.	No. of boats cleared.	Property conveyed.		Passengers.
			North & West.	South & East.	
	Doll. Cts.		Nett Tons.	Nett Tons.	Miles travelled
Philadelphia,	5002 58		1721		352111
Portsmouth,	25543 90	1327	20206	5312	19015
Harrisburg,	19650 09	1448	12572	12390	18742
Lewistown,	7703 84	458	1553	5082	15614
Huntingdon,	3564 08	424	1704	2320	211810
Hollidaysburg,	3847 10	428		1009	1383
Conemaugh,	375 00	60	1138		5493
Blairsville,	14225 00	693	8999	2676	199635
Leechburg,	4355 85	291	8326	315	542
Pittsburg,	4993 20	821		5406	40198
Northumberland,	7670 88	727	4133	8100	1523
Berwick,	3416 32	239	955	4870	2203
Bristol,	11418 6	3071	18235		4341
New-Hope,	1675 03	338	267	11544	1868
Easton,	31731 46	2214		100277	3840
Portsmouth out-let locks,	516 32				
do. Bridge over Swatara,	541 76				
Bridge at Duncan's Island,	3485 06				
Aqueduct at Duncan's Island,	61 41				
do. at Shaver's ford,	10 00				
do. at Jack's Narrows,	144 62				
do. at Kiskeminetas,	250 83				
do. at Pittsburg,	736 71				
	$151,419,69	12,529	79,813	159,281	878,318

APPEAL

TO THE

PEOPLE OF THE STATE OF NEW-YORK

AND THEIR

REPRESENTATIVES IN THE LEGISLATURE,

IN FAVOUR OF CONSTRUCTING

The Genesee and Allegany Canal.

NEW-YORK:

G. F. HOPKINS & SON, 44 Nassau-street.

1833.

GENESEE AND ALLEGANY CANAL.

At a meeting of citizens in the city of New-York, favourable to the construction of a canal from *Rochester, on the Erie Canal, to Olean, on the Allegany River*, held at the Shakspeare Hotel, Oct. 11, 1833—Christian Bergh was called to the chair, and Edwin Williams appointed secretary. After full discussion, and a variety of interesting statements, it was unanimously resolved,

1. That in the opinion of this meeting, from the statements made, and information obtained from authentic sources, the proposed canal will have an important bearing on the growth and prosperity of this State, particularly of this city, and ought to be constructed at the expense of the State; inasmuch as it will open a new and great thoroughfare through the rich valleys of the Genesee, Allegany, and Ohio, to the Mississippi.

2. That a Committee of 45 gentlemen, from all the wards of this city, be appointed to call the attention of the citizens generally to the subject of this canal, and to take such measures to present this subject to the Legislature at the next session, as shall be expedient.

CHRISTIAN BERGH, Chairman.

Edwin Williams, Sec'y.

COMMITTEE.

Christian Bergh,
Gideon Lee,
Thaddeus B. Wakeman,
George Sullivan,
James Tallmadge,
Charles O'Connor,
Charles G. Ferris,
Edwin Williams,
William Scott,
George F. Hopkins,
David Bryson,
Philip Hone,
George Curtis,
Stephen Potter,
Martin E. Thompson,
John Lang,
Jeromus Johnson,
Barnabas Bates,
John L. Graham,
Benjamin Huntington,
George Ireland,
Eldad Holmes,
Richard S. Williams,
Samuel Thompson,
Ashur Riley,
Clarkson Crolius,
John Heath,
Preserved Fish,
Henry W. Bool,
Ebenezer Smith,
Daniel B. Tallmadge,
Joshua Brush,
John R. Peters,
Stephen Allen,
Smith Ely,
Francis Fickett,
Heman Norton,
Charles H. Hall,
James N. Wells,
John Lovett,
Alexander Stewart,
Thomas T. Woodruff,
Stacy B. Collins,
Dudley Selden,
Philetus H. Woodruff.

The foregoing Appeal was prepared by the above Committee, for the use of the Legislature.

CHRISTIAN BERGH, Chairman.

AN APPEAL, &c.

In this Appeal it is proposed to shew, 1st, that the connexion of the Allegany with the waters of New-York harbour is practicable by canals through Pennsylvania and New-Jersey: 2. That it is practicable by a canal from the Allegany within New-York to the Genesee River, and thence by the Erie Canal and Hudson River: 3. That the expense of constructing the Genesee and Allegany Canal, will be covered by the increase of tolls on the Erie Canal, and of taxable property within the western counties of the State: 4. That the Genesee and Allegany Canal as a public highway is preferable, at the present time, to every other mode of connecting the great western rivers, the Ohio and Mississippi, with the waters of New-York harbour, and will lead eventually to the construction of a rail-road through the southern counties of the State to the Hudson River: 5. That the construction of such a canal and rail-road will secure to the city and State of New-York a large portion of the immense trade with the population on the banks of the Allegany, Ohio, Missouri, and Mississippi, which is now transacted at Philadelphia, Baltimore, Washington and Alexandria on the Potomac, and in New-Orleans.

I. That the connexion of the Allegany with the waters of New-York harbour is practicable by canals through Pennsylvania and Jersey.

In the year 1789, some distinguished citizens of Pennsylvania formed The Society for Promoting the Improvement of

Roads and Inland Navigation within that State. Their surveys and estimates and perseverance finally resulted in the construction of canals and rail-roads between Philadelphia and Pittsburgh. The Grand Pennsylvania Canal, commencing at Columbia, on the Susquehannah, at the termination of the Philadelphia and Columbia Rail-road, 40 miles from that city, extends westward 172½ miles along the Juniata, till it meets the Allegany Portage Rail-road at Holidaysburg. This road runs 36 miles to Johnstown. Thence the western division of the Grand Pennsylvania Canal runs westward 105 miles to the Monongahela River at Pittsburgh. The Allegany Portage Rail-road crosses the Allegany mountains at the height of 1398 feet above the basin of the canal on the eastern side, and 1171 feet above that on the western side. The Schuylkill Canal and Navigation Company, incorporated in 1815, have completed their canals and locks along this river from Philadelphia to Reading, on the Schuylkill, 61 miles. The Union Canal, connecting the Susquehannah with the Schuylkill, was constructed so recently as 1827. It commences four miles below Reading, on the Schuylkill River, and extends to Middleton, on the Susquehannah, 82 miles. The whole amount of costs and estimates for completing these works and other auxiliary constructions is 20,267,280 dollars, of which more than 16,000,000 have been already expended.

Another route from the Susquehannah to the Allegany was surveyed many years since, by the celebrated English engineer, Weston, and by him reported practicable within the experienced cost of other constructions deemed practicable: that is, by the Juniata, the Connemaugh, and the Kiskeminitas, with a portage over the mountains of 18 miles. The Pennsylvanians, as it appears by published reports of their society above mentioned, have also extended their views up the Allegany and French Creek, with a design to obtain the trade of Lake Erie. They have also contemplated a connexion between the Susquehannah and the Allegany by a canal within the State of New-York, with a view to draw the trade of the

west up the latter and down the former, and thence, by the Union Canal, to the Schuylkill and Philadelphia! The great Delaware and Raritan Canal, now on the point of completion, connects the waters of the Delaware with the waters of New-York, which, with the rail-road now established between New-York and Philadelphia, will give fresh inducements to the Pennsylvanians to enrich their State by facilitating transportation across it from New-York to Pittsburgh.

It is true there are great obstacles to be overcome between the Susquehannah and the Allegany, within the State of Pennsylvania; but without disparaging the enterprise of that State, it may be safely said that a New-York Legislature, realizing, as it has done, the immense benefits of canal construction within this State, were they legislating for Pennsylvania and sitting at Harrisburg, would surmount those obstacles, and form that connexion with the least possible delay: and it should be known that measures are now taking in Philadelphia to achieve that object by connexions between the nearest points of the Susquehannah and the Allegany within Pennsylvania.

II. The connexion of the Allegany with the waters of New-York harbour is practicable by a canal from the Allegany, within New-York, to the Genesee river, and thence by the Erie Canal and Hudson river.

In respect to this branch of the subject, reference is made to the reports of the Canal Commissioners, printed with the Journals of the Assembly for the year 1826, in the appendix (F.) They are printed at large in the appendix to this Appeal.

III. The expense of constructing the Genesee and Allegany Canal will be covered by the increase of tolls on the Erie Canal, and of taxable property within the western counties of the State.

The Genesee and Allegany Canal may be estimated at an equal cost with any equal section of the Erie Canal, say of 90 miles. Then the Erie Canal is to be considered as extended by this branch into the western rivers and the States of

Ohio, Indiana, Illinois, Pennsylvania, Virginia, and Kentucky and Missouri, so that the whole extension of the Erie Canal to Hamilton, on the Allegany, by this southwestern branch from Rochester, which is 270 miles from Albany, will be the same in length as from Rochester by the western branch to Buffalo, which may be considered also as extending into the State of Pennsylvania and Ohio, on the lakes. Treating the Allegany and Genesee Canal as an extension of the great trunk of the Erie Canal, is doubtless the correct view of this proposed construction; for it is now apparent from the vast increase of trade and transportation on the western waters, and the practicability of steam navigation from Pittsburgh to Hamilton, on the Allegany, a condition of inland navigation not known nor contemplated at the first design of the Erie Canal, that the projectors of this great work should have directed it towards the western rivers as well as towards the lake Erie. It is indeed most clear to every man's apprehension, that if the State of New-York, with a full knowledge of the existing state of western trade and navigability of the Allegany, were limited to the alternative of terminating its Erie canal in the lakes or in the western rivers, the latter most certainly must be preferred, as opening an extent of river shores through a populous and fertile country, exceeding, by many thousand miles and many millions of people, the extent of lake shores and number of lake population, directly connected with this canal, independent of foreign favour. But happily the State of New-York may now construct both branches of the Erie Canal, and enjoy the benefit of the trade from the rivers as well as the lakes.

These views are founded on the general principle governing the profit of canal structures, stated by Mr. Gallatin, in his report as Secretary of the Treasury to the Senate of the United States, in April, 1808. "Canals," he says, "with a few "exceptions, cannot, in America, be undertaken with a view "solely to the intercourse between the two extremes of the "canal and along the intermediate ground which they occu- "py. It is necessary, in order to be productive, that the ca-

"nal should open a communication with a natural extensive "navigation which will flow through that new channel." "It "follows, therefore," says he, "when a canal has been con- "structed, and it might be connected by another canal to "another navigation, the first constructed canal will remain "comparatively unproductive until the other improvements "be effected, until the other canal also be completed." Thus, if the Erie canal had terminated in its course westward at the Genesee, it would have remained comparatively unproductive till its extension southward to the western rivers, or westward to the western lakes. Had the southwestern branch of the Erie canal to the Allegany been first constructed, the same reason for extending the westward branch to the lake, would have pleaded with no less force, but not greater, than does this appeal to the people and the Legislature of New-York in favour of the south-westward branch from the Genesee to Allegany.

The report of Mr. Gallatin, above referred to, was made in obedience to the order of the Senate of the 2d March, 1807, which embraced the whole subject of canals connecting the Atlantic with the great western rivers. And it appears from the report that no mode of crossing the Allegany mountains from the Atlantic to Pittsburgh, was deemed practicable by canals north of the Potomac. The connexion of the Susquehannah with the Allegany, by the modes above mentioned, was adverted to by Mr. Gallatin, but deemed inexpedient. He insists much on the great importance to the Union and to the Northern and Middle States, of effecting some convenient mode of turning the Allegany mountains on the north, and connecting the great western rivers with their Atlantic harbours. But at that day the great project of the Erie canal had not been sufficiently developed to shew that by this means the great barriers between Atlantic and western commerce might be turned on the north. In this view of the object of this appeal, it rises into a great national work which is to be consummated on the soil of New-York, by the construction of this canal, well worthy to be considered as the south-western

branch of the Erie Canal, and as such destined to add no less to the productiveness of the grand trunk of the Erie Canal, than its present extension from the Genesee to Lake Erie has done and is doing every year.

But the building timber upon the banks of the Allegany, within this State, and along its banks in Pennsylvania, comprising five hundred miles of shores, exceeds in quantity the supply of New-York ship-building for the next ten years, and perishes annually or is consumed for fuel, through mere want of conveyance to the Atlantic. Builders, both in naval and civil architecture in the city of New-York, are paying annually large sums of money for supplies of timber and lumber from other States at great prices and for inferior qualities, while our own timber, of superior quality, perishes where it grows.

But the inhabitants of the western counties generally are interested in this construction. Their property will be largely increased in value by the increase of population and business incident to the establishment of another extremity to the Erie Canal, which connects it with a "natural extensive na-"vigation that will flow through that new channel."

On inspection of the census of 1820 and 1830 of the United States, and of our state census in 1825, an astonishing increase of population, wealth, and advancement, will be perceived at the extremities of our great inland navigation, and at places of entrepôt along its route. The increase in the 8th senatorial district at the western extremity, from 1825 to 1830, exceeds even that of the 1st senatorial district, including New-York and Suffolk, Queens, Kings, and Richmond counties. Referring to Williams's New-York Annual Register, a work of unquestioned accuracy, it will be seen that the increase in these two districts from 1825 to 1830, was far greater than in any others. The increase of the 1st district being 48,723, the double of any other district except the 8th, and the increase of the 8th being 76,211, approximating to the double of that of the first.

It is remarkable that among the counties which compose

the 8th district, the increase during those 5 years, in Allegany, Cattaraugus, and Chatauque, is the greatest, and the number of paupers is less than in most other counties of the State — and that the aggregate increase of population in this State, 302,674, since the healthful and invigorating action of the Erie Canal, exceeds the whole number of population in each of nine States in the Union, and nearly equals the population in each of five more. These facts demonstrate, beyond all question, that the establishment of another extremity to the Erie Canal must advance the wealth of the counties in its vicinity on every side. The southern counties along the Pennsylvania line must share in this benefit, in common with the other southwestern counties, and all must enjoy a large increase in every kind of valuable and taxable property.

The cost of this new branch of the Erie Canal, which can scarcely be sufficiently described by a name so limited as the Genesee and Allegany Canal, will be covered by the tolls. This is easily demonstrated. The cost of constructing the Erie Canal from Genesee to Buffalo is covered by the tolls, which this branch adds to the earnings of the rest of the canal; and not by the tolls collected for transportation on that part of the canal. In like manner the cost of this new branch will be covered by the tolls collected along the whole route of the whole canal, on merchandise which this branch will carry to and from the western rivers. If it be admitted that the cost of this branch will not exceed the cost of the Erie Canal from the Genesee to Buffalo, and that the quantity of merchandise brought from the western rivers and conveyed to them will be no less than the quantity brought and conveyed by the branch from Genesee to Buffalo, the conclusion is irresistible, that the expense of the proposed canal will be as entirely covered as is the expense of the canal from Genesee to Buffalo. It has never been considered necessary that each section of the canal should produce tolls to the amount of 7 per cent. on its cost. It is enough if the whole receipts cover the interest on the whole cost. But in

constructing another branch to a natural and extensive navigation, it is sufficient warrant for incurring the expense, if there be a reasonable presumption that it will bring and carry such an additional quantity of merchandise as will yield tolls throughout the whole extent of the canal to the amount of 7 per cent. on its own cost. Of this result no one can doubt from the extension of the Erie Canal by this new branch towards that vast and increasing inland navigation. The rivers will yield and require as much transportation as the lakes, and the business on each will naturally augment both.

The amount of taxable property in the southwestern counties in buildings occupied as dwellings and stores, and in the increased value of their timber and farms and manufactories will not and cannot be overlooked as an argument in favour of this construction.

IV. The Genesee and Allegany Canal, as a public highway, is preferable at the present time to every other mode of connecting the great western rivers with the waters of New-York harbour; and its construction will lead eventually to the establishment of a rail-road through the southern counties of the State, to the Hudson river.

It is preferable, because that connexion will be effected first by the state of New-York, by constructions wholly within its own limits. The great advantage of making the first connexion by water between the Atlantic and the western rivers north of the Potomac, is manifest from the report of Mr. Gallatin, who observes that after the course of trade is once established upon any convenient route, it is scarcely possible to divert it into another channel. This fact he uses as an argument in favour of adopting at first the most convenient route. This mode of connexion is preferable now, because it is the most convenient route for transporting supplies from the largest market of foreign goods, where, of course, the producer finds the best market for his productions of every kind. It is also preferable now, because it is wanted as a less expensive mode of transporting merchandise from New-York to the banks of the great western rivers of the Al-

legany and Ohio, the Missouri and Mississippi, during the summer months, when the commerce of New-Orleans is for the most part suspended. It is preferable to a rail-road, because it may be sooner made and with far less expense. Yet it will lead to the construction of the rail-road contemplated between the Allegany and the Hudson, because, in the course of a few years, the transportation between the western waters and the Hudson will probably require both of these means of conveyance. The transportation through Utica, at the present time, equals in quantity, every twenty-four hours, the whole lading of two large ships in the Liverpool line of packets.

But it is preferable because the rate of tolls between the Hudson and the Allegany can be regulated at convenience by our own Legislature. It is enough if the aggregate receipts of all the canals cover the expense of all by yielding 5 per cent. on the whole.

V. The construction of such a canal and rail-road will secure to the city and State of New-York a large portion of the immense trade with the population on the banks of the Allegany, Ohio, Missouri, and upper Mississippi, which is now transacted at Philadelphia, Baltimore, Washington and Alexandria on the Potomac, and in New-Orleans.

By far the largest portion of population on the western waters, lies on the banks of the Ohio and Allegany, nearer to the Hudson than to New-Orleans, and it will always be in the power of this State by making the transportation cheaper between the Hudson and the Allegany, to secure the trade from Cincinnati and the banks of the Ohio for the city and State of New-York, if ever a lower rate of transportation of foreign and domestic manufactures should be essential to this result. But as a large portion of these manufactures, which now ascend from New-Orleans, have been, and must needs be, imported into New-York, and be sent coastwise to New-Orleans, before they can reach the shores of the Missouri, the upper Mississippi, and the Ohio, the freight and insurance from New-York to New-Orleans, must be superadded to the river trans-

portation upwards, and in this view it is clear that New-York must secure to itself, by the construction of this canal and of the rail-road from the Allegany, a large portion of the trade which is now transacted in New-Orleans, and by parity of reasoning, a large portion of that done through the Chesapeake and Ohio Canal to the Potomac, and the Grand Pennsylvania Canal to the Schuylkill: for New-York sends her importations to every city in the Union.

It is respectfully urged upon the people and the members of the Legislature, that the present is the fitting time for action. The whole country is prosperous beyond all former conditions of welfare; engineers of experience are at hand; and practised labourers are numerous. The necessaries of life are cheap, and wages low. A spirited effort might accomplish this great national work within a year from its commencement.

CHRISTIAN BERGH,
Chairman of the Committee.

(APPENDIX F.)

REPORT

From the Canal Commissioners, pursuant to the act entitled "An act to provide for the Survey of certain Canal Routes therein mentioned." Made to the Assembly March 6, 1826.

To the Legislature of the State of New-York.

The Canal Commissioners, in obedience to the provisions of an act entitled "an act to provide for the survey of certain canal routes therein mentioned," have caused surveys and examinations to be made of the most eligible routes for navigable communications, in the following places, to wit:

From the Seneca lake to the Chemung river.
From Syracuse to Port Watson.
From Chenango point, by the town of Norwich, to the Erie canal.
From the valley of the Unadilla to the Erie canal.
From the Cayuga lake to the Susquehannah, near Owego.
From the Erie canal in the county of Herkimer, to the St. Lawrence.
From the Erie canal at Rome, by Boonville, to Ogdensburgh.
From the Erie canal at Rome, by Camden, to Ogdensburgh.
*From Rochester to the Allegany river, by various routes.
*From the Erie canal to the Allegany, by Batavia.
*From the Erie canal to the Allegany, by the valley of the Conawanga.
*From Portland on lake Erie, to the head of Chatauque lake.
From the Champlain canal to the Vermont line, by various routes.
From Gravesend Bay, through the bays on the south shore, to the east end of Long-Island.
From Schoharie creek to the valley of the Catskill.

Messrs. Geddes, Roberts, Thomas, Hutchinson, Young, Whippo,

and Sargent, were the engineers employed to survey the above mentioned routes; their reports, maps and estimates, are herewith transmitted, and will furnish the legislature with the necessary information on the subjects to which they respectively relate.

The foregoing surveys, and the one submitted a few days since, of the route from "Sharon or near thereto, to the tide waters of the Hudson," are all the routes comprised in the above mentioned act, excepting a short route from Rochester to lake Ontario.

SAMUEL YOUNG,
HENRY SEYMOUR,
WILLIAM C. BOUCK.

6th March, 1826.

GENESEE CANAL.

A canal from Rochester to Genesee will pass over a country so favourable to the making one, that notwithstanding the valuable river navigation now used between these places, an artificial canal will undoubtedly be accomplished. The route of a canal may follow a track almost as direct as a road along the river.

From the upper end of the feeder to Geneseo, will be about 27 miles, the making of which will cost less perhaps than any 27 miles of canal ever did, exclusive of lockage. The rise from the Erie canal to Squawkey hill is 68 feet, to Geneseo feet.

At Squawkey hill, a smooth surface gives place to the narrow defile, the deep chasm, and the frowning precipice.

From below Smith's mills in the town of Nunda above the great falls, the river enters a country of tremendous gulfs, passing down cataracts, and through rapids, falling 453 feet to Gardeau flats, thence running rapidly to Squawkey hill with a fall of 76 feet more.

To make a canal which will have in it this 529 feet of lockage, it must pass the first falls below Smith's mills in the river bed, defended by masonry until it gains the table land immediately below, where the face of the country will admit of its leaving the brow of the gulf below, and by some deep cuttings through points of hills, pass on to a very smooth faced country of clay soil, over which a canal can be conducted down the hill to the river near Mount Morris.

Sixty-six locks of 8 feet lift each, will have to be placed in a space not exceeding nine miles, allowing something more than a furlong to each lock.

Following up the river from Smith's mills to the mouth of Black creek 22 miles, the valley is free from high precipitous rocky shores, but some obstructions by slip banks of clay, occur in several places. To secure against those slips, is sometimes difficult, and great disasters are often occasioned by them. Excepting these threatening slips, the valley is favourable to the making a canal in it. The lockage in this 22 miles is 162 feet, not quite an eight feet lock to a mile.

Following up the valley of Black creek, another rapid rise takes place. In three miles there will be 17 eight feet locks: some rocks on the falls on Black creek, but they are of a loose texture, and their removal will not be expensive. They are a yellow sand stone, in which shells of numerous varieties are embedded.

From these falls seven miles to the summit, the surface is smooth, but the earth is filled with loose stones, producing most unpleasant roads along the valley.

The whole rise from the Erie canal to the summit, is 981 feet. On this summit, between Genesee and Allegany waters, there lies a swamp, about two miles in length. This swamp, which is in some places open, and in some places timbered, drains into Black creek, and into Oil creek. It will be profitable to cut down this summit eight feet in the deepest place, and the lockage is so calculated.

This summit pound must be extended down the north side of Oil creek valley to its junction with Ishua creek, where, from a feeder of two miles in length, the whole of the Ishua creek can be received into the summit level.

The length of the summit will be eight miles; it will pass down the Oil creek valley with facility, not running much on the face of the steep hill, although the junction of the streams is 41 feet below said summit level.

The whole fall to Allegany at the mouth of Olean creek, is 78 feet — whole lockage ascending and descending, 1,059 feet.

The length of canal to be made from the upper end of the feeder near Rochester to Olean, will vary little from 100 miles. The lockage is equal to 132 eight feet locks on this canal of 103 miles, measuring from the Erie canal to Allegany river. The Union canal, now making in Pennsylvania, between the Susquehannah and Schuylkill, is 75 miles long, with 90 locks. As 75 is to 90, so is 103 to 123, exceeding the proportion to the Union canal by 9 locks.

A passage from the Ohio valley to the Genesee valley, is here 1488 feet above tide level, and is less elevated than any passage that

has been examined, either to the Potomac or to the Susquehannah valleys. The canal proposed from the Conamau to Juniata, through a tunnel four miles long, is (taking "the level that has been assumed) 1831 feet above the tide,"* an elevation of 343 feet more than the pass to Genesee valley, which will be without tunnel or deep cutting.

But from examinations made by Mr. Whippo, there is a passage found up the Conawanga valley, the summit 724 feet above the level of lake Erie. Add 570 feet, the elevation of lake Erie above the ocean, and said summit stands but 1294 feet above tide level — 194 feet lower than that of Oil creek and Genesee. Mr. W. gives the fall to Warren, in Pennsylvania, in 24 miles, 132 feet. Pittsburgh being 756 feet above tide level, it results, that there is but 406 feet rise from Pittsburgh to Warren. The length of a canal from Buffalo to Warren he makes 89 miles. In this 89 miles the lockage will be 724 feet up, and 132 down, equal 856 feet, making 107 eight feet locks in 89 miles. The lockage on the canal here proposed, when compared with its length, bears a remarkable comparison with the Union canal—as 75 miles is to 90 locks, so is 89 miles to 107 locks. This summit pound can be fed from the Chatauque lake, which was styled by Mr. Gallatin "an extensive and important elevated reservoir."†

The Oil creek and black creek summit has some peculiar features. At the mills of Cady and Baldwin, on Oil creek, which is the highest point from which arks and rafts have been sent, the high floods flow over the intermediate ground, (a marsh) and pass to the gulf of St. Lawrence instead of the gulf of Mexico. — Permanent streams of each pass in the marsh within twenty chains of each other.

The Oil creek descends with a moderate current to the Ishua, in which distance are three saw mills that would lose all their water by a canal.

Lime, which abounds at Batavia and a small distance south, has been found lately south of Perry village, but a little west of the Genesee river, on a very high level. The earthy lime is found in many places near the proposed canal line, particularly at Lime lake, which is proposed to be brought into the Ishua, to feed the upper level of this canal.

A summit pound here would be abundantly supplied with water. The drainage of 190 miles of surface can be turned into it. See map No. 10, where this tract is marked out by a red dotted line. Mr.

* See report, &c. of the commissioners, &c printed at Harrisburgh, 1825, page 40.

† Gallatin's report, &c.

Roberts gives the following account of the capacity of the streams in October last.

Ishua creek at Farewell's mills — cubic feet per minute, .	750
Lime lake, Beaver lake, and Peacock lake, which can be brought through feeders into the Ishua, (see map No. 5,)	400
Oil Creek,*	450
Together per minute,	1600

The four feeders shown on map No. 5, are, together, 11 miles long, which may be valued as so much canal.

Estimates then will be on

111 miles canal, at $5000 per mile, ...	$555,000
1059 feet of lockage, at $150 per foot rise, . .	158,850
Extras for passing Genesee falls, ...	30,000
Deep cutting on the summit two miles long, deepest eight feet, ...	12,320
Deep cutting on Lime lake feeder, one mile ten feet	10,560
To secure against slips on Genesee river, . . .	30,000
Aqueduct over Canaskraga, ...	10,000
Dams at Conesus and Honeyoe outlets, . . .	2,000
Dam on Genesee river at the mouth of Black creek,	2,000
Amounting to	$810,730
For superintendence and engineers, add 8 per cent. .	64,858
Total amount,	$875,588

To the Honourable Canal Commissioners of the State of New-York.

GENTLEMEN—

Agreeably to a request communicated to me by the Hon. William C. Bouck, I have examined three of the canal routes authorized to be surveyed by an act of the legislature of the winter of 1825, to wit: One from Portland, Chatauque county, to the head of the Chatauque lake; one from Lake Erie to Allegany river, through the valley of the Conewango; one from Scottsville, by the way of Le Roy, to the upper falls of the Genesee river; and also a part of the route from Rochester to Allegany at Olean, through the valley of Genesee river. These I shall take up in the order in which they are mentioned.

* Mr. Roberts made Oil creek at its mouth 551 feet; about 100 feet perhaps cannot come into the summit pound.

1. Route from Portland to the head of Chatauque lake. I arrived at Portland on the 20th of September. The harbour here is of considerable importance, as it is becoming a principal landing place, not only for the goods which are consumed in its immediate neighbourhood, but also for much of the merchandise that is designed to go down the Allegany river. It is situated on lake Erie, in Chatauque county, about sixty miles above Buffalo, and is formed on the west by a bar of sand and gravel, which extends into the lake about eighty rods, and upon which a pier and store house are already erected. From this point, the bar turns at an angle of about ninety degrees, and takes an easterly direction until it meets the shore, leaving a space or entrance of about one hundred feet in width, a short distance east of the angular point, as is represented in the subjoined map and plan.

A pier of proper height commenced at this opening and opposite the one on the west side, and extending in an easterly direction along the bar seventy-two rods, thence turning at an angle of about eighty degrees and running to the shore, would make a very commodious and cheap harbour, giving an area of six hundred and sixty square rods of six and a half feet of water, and an area of two thousand seven hundred and seventy-two square rods of three and a half feet water. After a cursory examination of the country between Lake Erie and Chatauque, I judged the route to be practicable, and commenced taking levels at the harbour, and proceeded to the last mentioned lake. The difference of elevation between the two is 723.9 feet, which is the amount of lockage on this route. The distance between the two points is about ten and a quarter miles, the first seven and a half of which are remarkably favourable; the surface of the ground is very smooth and regular, the soil an easy sandy loam, and the grubbing and clearing light. The remaining distance will be a deep and expensive cut through a ridge, rising in the distance of twenty-one chains to fifty-two feet above our level; thence gradually descending to the level again, in the distance of one hundred and ninety-nine chains, making an average cutting of twenty-six feet. The soil is a clayey loam, and there are no indications of rock even in the bottoms of deep wells; and as a further proof of this, we found no rock in the ravine formed by the Little Chatauque, which winds round the foot of this ridge, and which within two miles is at least two hundred feet below our level.

This route must be supplied with water from the Chatauque lake, which I think will be adequate. I gauged its outlet on the 3d of October last, during a very severe drought, and it then furnished 2295 cubic feet of water in a minute.

Estimate of expenses.

7½ miles at $4000, including contingencies,	$30,000 00
2¾ miles deep cutting, at $114,322,	314,385 00
724 feet lockage, (timber locks,) at $75 per foot,	54,300 00
	$398,685 00

Second Route from Lake Erie to Allegany, through the Valley of the Conawango.

I commenced taking levels at the head of the first rapid on the Chatauque* outlet near the village of Jamestown, and proceeded down its valley to Warren on the Allegany river. This outlet is remarkably serpentine, but as the flats are wide, the canal will not require to follow its windings, but may be carried across from bend to bend, as designated on the subjoined map.

The distance, as we collected it from maps of actual surveys, is about twenty-four miles, and the whole descent is one hundred and thirty-two feet. We found no obstructions in this route, with the exception of about three-fourths of a mile of steep banks; but as these are not high or rocky, and the soil an easy loam, we did not consider them formidable.

About four and a half miles of this distance from the heads of the first rapids where we commenced taking levels, must principally be fed by the waters of the outlet, taken directly from this point; below which the Cassadaga and several other streams come in sufficient for a supply.

By using wood for locks, the whole expense of constructing a canal down this valley, including these and every contingency, will not much exceed three thousand five hundred dollars per mile, as will be seen by the following estimate:

Grubbing and clearing 24 miles, at $400 per mile,	$9,600 00
Excavating 4 feet deep, $2,124 per mile,	50,976 00
Lockage 132 feet, $75 per foot, average cost per mile $412.50,	9,900 00
Contingencies at $564 per mile,	13,536 00
	$84,012 00

* Chatauque lake, as I was informed by Mr. William Peacock, agent for the Holland land company, contains by actual survey 16,000 acres, and is 18 miles in length. The depth in its middle will not vary from 30 to 100 feet. I gauged its outlet on the 3d day of October last, during a severe drought, and it then furnished 2295 cubic feet of water in a minute.

On our return from these examinations, we commenced at the mouth of the Conawango, where it comes into the Chatauque outlet, and run a level up to its source, making the summit at this place only six feet higher than the Chatauque lake. We had been led to believe that we should find a sufficiency of water here to supply this level and the locks, as far as Cattaraugus creek, and also down the Conawango as far as necessary; but in this we were disappointed.

The streams in this quarter, during the dry season of the year, furnish very little water, and cannot therefore be depended upon. We ran a level to the south branch of the Cattaraugus, with a view of ascertaining the practicability of bringing it in as a feeder; but it was too low, and there was no longer any hope of finding water on this summit, except by the way of Chatauque outlet, which I was satisfied could be easily effected, by maintaining the level along the south side of the ridge between lake Erie and the valley of the Conawango, in a westerly direction, until it terminated at the point proposed, as delineated on the map.

Besides the water which would be here supplied for the use of this level and the lockage, from the summit at the head of the Conawango to Cattaraugus creek, (say 470 feet,) we shall be able to command several other considerable feeders, amongst which are Cherry and Clear creeks; the one furnishing about four hundred and the other about six hundred cubic feet of water per minute, even in the driest times.

The route, so far as I am able to judge from actual observation, and from the concurrent information of several intelligent persons, I have no hesitation in saying is practicable, and a considerable part of it favourable. The soil is easy, and unencumbered with rock: there will be no deep cutting, and but one considerable embankment, which will be at the Cassadaga outlet.

We did not run a level so as to ascertain where it would be necessary to cross the stream, and could not therefore determine as to the cost, but presume it would not vary much from $15,000, including the culvert.

The other expenses may safely be put at $4,500 per mile.

Distance 30 miles; amount of expense,	$135,000
Embankment and culvert,	15,000
	$150,000

The face of the country from the summit at the head of the Conawango to Cattaraugus creek, is considerably cut up with ravines;

but as they generally run parallel with the line which we wish to pursue, (especially if the southern summit* be adopted, which we also examined, and which is probably the best of the two,) no very important inconvenience will be sustained on account of them, and we shall be enabled to choose our ground, in reference to the most direct and feasible route. The expense upon this part of the line, exclusive of lockage, may very properly be compared with that last above mentioned, except in relation to the culvert and embankment of Cassadaga creek.

Distance 5 miles, at $4,500 per mile, . .	$22,500
Lockage, 474 feet, at $75 per foot. . .	35,550
	$58,050

I assume 474 feet of lockage at this place, knowing that the whole amount is 724 feet, and believing, from information, that the bed of the creek at Lodi, is 250 feet above the surface of the lake. As the ground will be equally as favourable, or nearly so, and materials for the construction of locks as convenient, no great difference of expense will grow out of any error which may be committed in this calculation.

The point at which the Cattaraugus† can be most conveniently crossed, I think, is at Lodi: and this can best be affected by means of a dam. From this point we can easily wind out of its valley, and command its waters, which are amply sufficient to feed towards Buffalo.

Between the summit at the head of the Conawango and Buffalo, I did not deem it expedient to take any levels, as we had already ascertained the heights of the summits and the amount of lockage.

In proceeding from Lodi to Buffalo, we pass down upon the flats of Cattaraugus creek, which are often extensive, and always wide enough for the passage of the canal without any extra expense. In the distance of about six miles, we wind completely out of its valley on to the bank of the lake, which descends very gradually, and presents an even, regular surface. This continues all the way to Buffalo, with the exception of two ravines, one formed by the Eighteen-Mile creek, the other by Clear creek, which must be passed by culverts and embankments with considerable expense. This however will not exceed, in my opinion, $20,000 at each place. The excavation simply on this portion of the line, will not cost above $1900 per mile; but as there will be more culverts, bridges and embank-

* See Map.

† This is a large and durable stream, and at all seasons of the year will afford not less than 5000 cubic feet of water in a minute.

ments here than on any preceding portion, I think the expense exclusive of lockage and the two heavy embankments, may be estimated at $5000 per mile.

Distance 30 miles, at $5000 per mile, ...	$150,000
Two culverts and embankments, at $20,000 each, .	40,000
Lockage 250 feet, at $75 per foot, ...	18,750
Dam at Lodi, ...	2,500
	$211,250

Third Route from Scottsville, by the way of Le Roy, to the Upper Falls of the Genesee River.

In regard to this route it must be observed, that it pursues the same course, passes the same summit, and depends upon the same streams that the Genesee river route does, until it unites with the river. And as this summit and these streams were examined by Mr. Geddes last summer, I did not extend my examinations further up than Raymond's mill dam, a little above the mouth of Black creek, in the township of Belfast, Allegany county.

From this point it was proposed by the advocates of the route to begin to wind out of the valley of the Genesee river, maintaining the same level along its banks, so as to use its waters for the canal, and finally to gain such an elevation as to cross over the summit at the head of Allen's creek, thence to run down the valley of this creek to the river again, and so to the Erie canal at Rochester.

I was induced to believe, from a birds-eye view of the country, and also from some rough levels which had been taken by the inhabitants of Warsaw, that the summit was low, and that if the banks of the river were favourable, we should find no difficulty to contend with. We accordingly commenced our level, and run down about six miles, but in this distance we found many obstacles. The bank was extremely broken; steep, high points of ridges running quite to the river, with wide flats between, receding far back, and so low as to require heavy embankments; and in the rear of these flats we often saw deep ravines that appeared to have been worn out of the rock by violent floods, which indicated the necessity of large and expensive culverts.

After spending several days in this quarter, and finding that every step we advanced presented more and more difficulties, we resolved to abandon this project so far as related to this part of the route, and to go further down the river, hoping to find a place where the water could be taken out with less inconvenience.

The mouth of Cole creek appearing most favourable to this place, we commenced here and ran down as far as Wiscoy creek, near where it enters into the river, having descended about 30 feet. At this place we learned from the inhabitants that this stream had a perpendicular fall in it of fifty feet, within a mile of its mouth, and that it was very rapid all the way to its source.

From these circumstances, and perceiving that it arose near the head of Allen's creek, I concluded that the summit must be much higher than we had at first supposed. I therefore went directly to it and run a level to the river, which decided the question at once, by proving that it was too high even for our first level, and that to bring the river across it, it would be necessary to go as high at least as Angelica, which is seven miles above the mouth of Black creek. We came at this conclusion by knowing that the descent in the river did not vary much from eight feet in a mile. We therefore abandoned this route, and proceeded to the Canasaraga and Cushequa.

Part of the Route from Rochester to Allegany at Olean, through the Valley of Genesee River.

It has been ascertained that the principal objection to this route is the difficulty at Nunda falls, at which place the banks are steep, high and rocky, and run close into the shore. In addition to this, there are three perpendicular falls in the distance of a mile and a half, amounting in the whole to 274 feet. By a reference to the map, it will be seen that the river here makes a very circuitous bend, embracing a narrow neck of land which rises high above its bend.

Having only passed over this neck without measuring the distance, I could not form an adequate idea of its width, but am of opinion it will not vary much from 200 rods in its narrowest place, and that its height will not fall short of 200 feet. To encounter the difficulty at this place, therefore, it was obvious that the expense must be great, and it was hoped that some other could be found more feasible and better suited to the importance of the object.

The appearance of the map indicated two favourable points, to wit, the valley of the Cushequa and Canasaraga. And several intelligent gentlemen residing in that quarter were of opinion, that by keeping up the river a short distance, and preserving the level along its banks, we might easily wind out of its valley, and rise above the high lands at the heads of these streams.

To effect this, therefore, was the object of my examination. We commenced at a place called Norton's farms, near the middle of the east line of the town of Nunda, in a valley which opens through the country in an eastern and western direction, and is bounded on the south

by an extensive range of hills nearly parallel to it, and which appear to be of a uniform height. Here we found the main branch of the Canasaraga, which heads in the hills several miles to the north, and comes into the valley from that direction, and then winds off towards the east. We commenced our level in reference to this stream, and took a westerly direction along the valley.

No obstruction appearing in our way until we came to the Cushequa. The banks of this stream are high and wide, and should the Canasaraga route be adopted, it must be crossed by culvert and embankment, with a heavy expense. At this place the land begins to ascend.

We soon run up to sixteen feet, and within two and a half miles to fifty-eight feet, when we came to an abrupt ridge two hundred and one feet above our level, which extends quite to the river, and precludes the hope of getting round. The descent from this point to the bed of the river is four hundred two feet, and consequently below our level two hundred and one feet. To surmount this, allowing the descent in the river to be eight feet in a mile, (and it will not vary much from it,) it is evident we must go up a little more than twenty-five miles, and as the canal from the Allegany will probably come into the Genesee river at the mouth of Black creek, it is likely it may be difficult to unite the two without some extra expense.

As we did not measure the distance, and do not know any thing of the texture of the soil except from external appearances, our calculation of expense must be uncertain and liable to error. But as it may be desirable to know something on the subject, I submit the following estimate.

The distance of deep cutting from 16 to 58 feet, will be 2½ miles, and the amount of excavation, 1,510.422 cubic yards.

The earth is of a light loam, and a considerable part of it may be excavated for eight cents per cubic yard. But when we take into consideration the depth of cutting, and the distance to which much of the earth must be carried, I am of opinion the average expense will not fall short of 25 cents per cubic yard. This item then amounts to $377,605 55.

The ridge from whence it begins to rise abruptly to where the level cuts it on the opposite side, is about one hundred rods through, and to make a semicircular tunnel this distance of thirty-four feet span, which will only give sufficient space for an arched wall 28 feet span and three feet thick, would require the excavation of 27,744 cubic yards. I mention this size because it would be sufficient to admit the passage of two boats at a time, such as are used on the Erie ca-

nal, and any thing less than that would, in my opinion, so incommode the navigation as to more than counterbalance the difference of expense. What the expense of this excavation would be must depend upon the quality of earth through which we must pass. But supposing it to be favourable, as external appearances indicate, it would not fall short of 50 cents per cubic yard, which will amount to $13,872.

The arch way would contain 14,608 perches. For this work stone can be had within four miles, and in that case the expense may not exceed four dollars a perch, making the sum of $58,432. As to the expense of making the canal along the bank of the river, I think we could not reasonably estimate it at less than $6000 per mile, including grubbing and clearing, and all the contingent expenses. Distance 25 miles — $150,000. Here then we have an aggregate expense of $599,909 55.

While at Greigsville, we were informed that a connexion might be very advantageously formed between Rush creek and the west branch of the Cushequa, as these streams rise in the same swamp: but upon examination we found the lands so high as to put that route entirely out of the question. It should be here mentioned, that whether the Canasaraga or Cushequa route is adopted, the difficulties mentioned above must be encountered, as they are common to both. The Cushequa route is shorter by several miles, and may perhaps be preferable on that account.

The Canasaraga, at Dansville, is a very commodious mill stream; and I know of no place in the western country, (with the exception of Rochester,) so well calculated for hydraulic operations; and should it ever be deemed expedient to form a connexion with the Susquehannah river, there is no point perhaps more eligible than that between Arkport and one of the branches of that stream. The distance between the two points is short, and there are no obstructions in the way. I have seen the ground, and speak with confidence.

I was requested by Judge Bouck to make some examinations on the Allegany river, in relation to the improvement of its navigation. It not being convenient for me to attend to it myself, I engaged Mr. Cantine, my assistant at that time, to go down as far as Franklin, and collect such information as he supposed might have a bearing on the subject. The result of his inquiries he has communicated to me in a letter, a copy of which is herewith transmitted.

On his return, he informed me, that the distance from Warren to Franklin was sixty miles, and the descent of the river between the two places, was 189 feet. That the west bank, particularly, was

very favourable to the construction of a canal, with the exception of $3\frac{1}{8}$ miles. This distance, though more expensive than the rest, was by no means impracticable. The bottom of the river stony, but generally free from rock. No bluffs or sliding banks the whole distance. Materials of every description necessary for the construction of the work were very convenient, and in great abundance. He also learned from various respectable sources, that these remarks were generally applicable to the whole distance to Pittsburgh. Such being the facts, the cost per mile of making a canal from Warren to Franklin, exclusive of lockage, may not exceed $6000. This distance, being 60 miles, the expense amounts to . . $360,000
Lockage 189 feet, at $75 per foot, ... 14,175

$374,175

Now allowing the average cost per mile, from Warren to Franklin, to be applicable to the distance from Warren to Pittsburgh, we shall perceive that as the one is $6,240, nearly, and the other two hundred miles nearly, that the whole expense of that distance will amount to $1,248,000. And we also perceive, that allowing these and the calculations made for the second route, as communicated in this report, be true, that the whole expense of making a canal navigation from Buffalo to Pittsburgh, will not be equal to $2,000,000.

Now if the state of Pennsylvania will but bring forth her science and resources to this mighty enterprise, she may, in conjunction with the state of New-York, effect a work which, for its importance in a commercial, agricultural, and national point of view, cannot be equalled by any other similar undertaking in the union.

The above is respectfully submitted by

CHARLES T. WHIPPO.

Murray, January 28, 1826.

(*Copy of Mr. Cantine's Letter.*)

Dear Sir,

Agreeably to your directions, I proceeded down the Allegany from Warren to Franklin, in Pennsylvania. I left the former place on the 8th day of October last, accompanied by a gentleman selected by the citizens of Warren as a man the most capable of giving correct information of the operation of the floods, and of the river generally.

The stream was uncommonly low, which afforded the best opportunity of viewing its bottom. From the best information I could obtain from the citizens of Warren, I was of opinion the west side

afforded the greatest facilities, and my examinations were therefore principally confined to that side. My examinations may be classed under three heads. First, the descent in the river, by estimating the fall in the river by the different ripples, by comparing them with the two we had ascertained with the instrument. Second, to ascertain if the stream could be improved by damming, and locking, and canalling from one dam to another. Third, canalling on the west side, to be supplied with water from the river or the streams that fall into it.

First. Estimating the descent, I judged it to be one hundred and sixty feet; but on my return to Warren, on searching the prothonotary's office, I found by comparing our levels with a report made by commissioners appointed by the legislature of Pennsylvania, to survey a route for a canal from Lake Erie to the Allegany river at the mouth of French creek, I found the descent to be one hundred and eighty-nine feet. Those commissioners, in their report, regret that it was not in their power to procure an experienced engineer with proper instruments to investigate the route: it is, however, probable that that report is nearly correct.

Secondly, Draining the river, &c. — The reason why this mode of improvement was suggested, is, that it was feared the banks of the river would be so steep and difficult as to prevent the construction of a canal. To avoid this difficulty, several dams would be necessary, but it would be impossible to determine their location or number; not knowing the descent in the river from one point to another, and believing as I do that it would be better to construct a canal on the west side of the river, I shall therefore proceed to the result of my examination on that head.

Thirdly, Canalling on the west side, &c.

The distance from Warren to Franklin is sixty miles. Sixteen miles of this, the side-hill comes down to, or near the water's edge, at seventeen different places; which is moderately steep. At almost each of those there are several rods together, where there is a margin sufficiently elevated above the river, and wide enough to admit of a canal.

There are three miles of steep side hill; soil the whole of this distance of the sandy order, some places loamy with some detached masses of rock. The river along this distance not to exceed ten feet deep at any one place where it would be necessary to construct works for a defence to the canal, and the greater part of the distance less than three feet deep.

The bottom of the river, the whole distance, was stony, and all the information I could obtain from the old settlers, as to the changes of its channel and banks, agreed that they were few and gradual, and

the uniformity of the descent, the appearance of its banks, the great width of the stream, and its appearance generally, unite to show the information correct. There is not a bluff or sliding bank on the whole shore. A covering or lining of stone on the outer side of the tow-path, sloping at two to one, would be sufficient to protect it from the effects of the river; the stone for this purpose in many places would be obtained in digging the canal, and at other places from the bed of the river.

There are two chains of rock bank in horizontal strata; they will admit of being easily broken up; the bed of the stream at this point is rock, thinly covered with loose stones, which, when I viewed it, was but partially covered with water. There is good earth convenient to this place, to form the canal, and the stone for covering may be taken from the bank or the bed of the stream; the river is of good width here.

The residue of the distance, the canal may be carried through favourable ground at or near the foot of the hill, altogether out of the reach of the floods of the river.

As to a supply of water, on this subject there can be no difficulty. There are a number of streams that fall into the Allegany on the west side, and their descent is sufficiently rapid when they enter the valley, to be made use of as feeders, and to be crossed conveniently, the largest of which are Broken-straw, Oil and French creeks; there is every material necessary for the construction of the work in the vicinity where it will be used. The most intelligent gentlemen in that quarter united in stating that the river was of the same character from Franklin to Pittsburgh. I was cordially received by the citizens of Warren and Franklin, and every information in their power afforded.

Most respectfully,
Your obedient servant,

ABM. CANTINE.

To C. T. Whippo, Esq.

To the Honourable the Board of Canal Commissioners of the State of New-York

I take the liberty to address the following report:

That the following examinations have been made by your orders, for the purpose of ascertaining the practicability of constructing a canal, and of supplying the same with water, to connect the Erie canal with the Allegany river, by passing the village of Batavia, and up the valley of the Tonnewanta creek, to a summit to be formed between

Cattaraugus lake at the northeasterly, and Lime lake at the southwesterly extremity, and thence descending by the valley of the Ischua and Olean creeks, to the Allegany river at Olean Point.

For which purpose I commenced the 6th October, 1825, at the level of the Allegany river at Olean Point, at which place it is ten rods wide, and sends forth 12,236 cubic feet of water per minute. From thence an accurate level and measurement of distances was carried up the Olean creek 7 miles and 42 chains, to its junction with Oil and Ischua creeks in the township of Hinsdale, and found the rise to be 37.79 feet between the Allegany and Oil creek. Oil creek at its junction yields 551 cubic feet of water per minute, and the Ischua 766 cubic feet of water per minute, in the driest weather. From the mouth of Oil creek, the level and survey were continued up the Ischua through the townships of Franklinville, Farmersville and Yorkshire, to Lime lake, a distance of 27 miles and 66 chains from Olean Point; and the total rise from the Allegany river to Lime lake is 233.63 feet.

A canal from Olean to Lime lake would pass through a valuable tract of country, well cultivated, and abounding with pine and oak timber of the first quality. The soil is a sandy loam, easily excavated, and the surface is generally very regular on the line of canal. The summit dividing Ischua creek from the south end of Lime lake, is about one mile in length, through a tamrack swamp, and rises on an average six feet above the surface of Lime lake. Suitable stone for locks, &c. can be found along the line at convenient distances.

From Lime lake (which is on the summit) the summit level was carried in a direction towards Cattaraugus lake, and it is ascertained that Beaver lake is 62 feet, and Peacock lake 53 feet above Lime lake; and as both these lakes have several smaller ones connected with them, it is evident their waters can all be brought on the summit level.

Cattaraugus lake was found to be 22 feet above Lime lake, but being on the line of the canal, it must be cut through, and also a dividing ridge at the northerly end of the lake, which rises 15 feet above the level of the lake, and runs out to the level in 25 chains. From Lime lake to the north end of the deep cut, the summit level would be 24 miles, and the ground generally favourable, though in many places sidelying and steep, and all may be called heavy timbered land. The only deep cut unavoidable is through the Cattaraugus lake and the dividing ridge. The cutting through the lake would be 26 feet for half a mile, and through the ridge 41 feet for near one-fourth of a mile. The average cutting for two miles is about 20 feet, and it is to be presumed that rock would be met in those depths.

From the northerly end of this deep cut, the country slopes gently to the north, and the canal would follow the valley of the Tonnewanta

creek, which would be the principal feeder, and runs through a country of excellent soil and highly cultivated for 30 miles, to Batavia, and thence 20 miles further (having a choice of ground the whole distance) to the Erie canal. The whole distance or length of the Batavia and Olean canal is 101 miles and 66 chains.

The water to supply the summit level of this canal is as follows, viz:

The west branch of Ischua creek to be turned into Lime lake, yields per minute, ...			200	cubic feet.
Lime lake, from a surface of	150	acres, per minute,	150	"
Beaver and Fish lakes, do.	240	" "	200	"
Peacock & Mud lakes, *Cl'r. cr.*	250	" "	700	"
Cattaraugus lake, . .	150	" "	150	"
Surface of lakes, acres,	790	cubic feet water,	1400	per min.

Besides these, would be taken in several small spring brooks; and it should be understood that these calculations were made at the driest part of an unusually dry season. It is the opinion of respectable observing men, that these same lakes and streams have usually afforded more than double the quantity herein stated, during whole seasons in succession; and that these lakes might be made into reservoirs of more than double their present capacity, by erecting dams across their outlets of moderate height, and comparatively at a trifling expense, which would insure a supply of water on the summit adequate to the demands of extensive commercial operations.

The lockage on the Batavia and Olean canal is as follows:

From Cattaraugus lake northerly to the Erie canal,	1135.84 feet.
From Lime lake southerly to Allegany river, .	233.63
Total amount of lockage, rise and fall, is . .	1369.47 feet.

It is proper here to state the lockage on the Rochester and Olean canal, by the Oil creek summit, viz:

Total lockage north from Oil creek summit to Erie canal	981 feet.
Total lockage south from Oil creek summit to Allegany river, ...	78.79
Total amount of lockage, rise and fall, on this route,	1059.79 feet.
Difference of lockage between the two routes, .	309.63 feet.

The principal feeder for the Oil creek summit from the west is the Ischua creek, which can be taken out for that purpose at the foot of Farwell's mill race, three miles and twenty-four chains above the mouth of Oil creek, viz:

Ischua, at Farwell's mill, feet per minute, . . .	750
Lime lake, and Beaver and Fish lakes, which can be turned into the Ischua, ...	400
	1150
Oil creek, near the summit, say	150
	1300

Having viewed Oil creek summit as a remarkable depression across the country, and very favourable for a canal, the following examinations were made with a view to that object. The Allegany river at Olean is 2 chains 50 links wide, and moves at the rate of 100 feet per minute, at an average depth of $\frac{9.0}{100}$ foot, and sends forward 12,236 cubic feet of water per minute. Its total descent from Olean to Pittsburgh is 650 feet, and the distance 280 miles; and in order to a better knowledge of this fine river, a level was carried up the river 8 miles to Rea's mills near the Pennsylvania line, and in that distance the surface of the river had risen 17 feet. About half a mile below Rea's, the Oswago fork of the Allegany comes in from the east: this fine stream has a swift current, and sends out 2,500 cubic feet of water per minute. I had hopes that this stream might be brought to the Oil creek summit by extending the summit to the vicinity of Olean; and this I believe to be practicable, provided the Oswago could be taken out a few miles south of the Pennsylvania line. This feeder made navigable would lead into the region of stone coal.

A canal uniting with the Allegany river by either of the above routes, would accommodate a large section of our country, whose surplus products are equal in quantity and quality to those of any portion of the state in proportion to its cultivated land and population, in both which respects it is rapidly increasing. These are primary advantages to a large portion of our citizens, but with the state, other considerations are to be considered; as the great enhancement in the value of the state lands, which are known to abound in lumber of the best quality, and coal mines and other minerals, which are known to abound on the various branches of the Allegany, and the very extensive commerce which would be drawn through this canal, and down the Allegany and the Ohio, and from the countries adjacent.

With all these advantages, this canal would undoubtedly soon become a source of increasing revenue to this state.

All which is very respectfully submitted.

NATHAN S. ROBERTS, *Engineer.*

Lenox, Madison Co. N. Y.
18th January, 1826.

LETTER

Of Mr. Williams, author of the New-York Annual Register and Universal Gazetteer, &c.

New-York, Dec. 17, 1833.

Geo. Sullivan, Esq.

Dear Sir—With great pleasure I comply with the request of the Committee, of which you are a member, to communicate such statistical facts as occur to me of importance to present to the public, having a bearing on the proposed Genesee and Allegany Canal.

This canal appears to me to be the most important work of internal improvement that has been proposed in this State since the construction of the Erie and Champlain Canals. It is proposed to connect the Erie Canal at Rochester with the Allegany River at Olean, (or Hamilton Village,) by a canal about 90 miles in length, following the valley of the Genesee River. I understand this was a favourite project of the late Governor Clinton, who considered the connexion of the waters of the Allegany River with those of the Hudson, second in importance only to the connexion between the latter and the great lakes. Indeed it may be doubted whether the union of the waters of the Ohio valley, by the proposed route, is not equal in importance to the extension of the Erie Canal to Lake Erie. It has been a matter of surprise to many intelligent persons, that the State has so long delayed the construction of a work promising such incalculable benefits as the proposed canal. When completed, it is believed that more property will pass upon it, to and from Rochester, than on the Erie Canal west of that place.

The proposed canal, it is understood, will pass through part of the counties of Monroe, Livingston, Allegany, and Cattaraugus, intersecting one of the most fertile sections of the State, and a considerable portion of it abounding in valuable timber, of the utmost importance to the towns and villages on the Erie Canal, on the Hudson River, and to this city in particular, for the purposes of building.

For this object alone, and from justice to the people of a sequestered portion of the State, now deprived of the benefits of a good market for their lumber and produce, this work ought to be constructed from motives of policy, interest, and justice.

But when we take into view the vast extent of country embraced in the Ohio and Mississippi valleys, our sense of the immense consequence of the proposed canal to this State, and the internal commerce of the city of New-York, is greatly enhanced. The Allegany River is navigable for steam-boats a great part of the year, and unites with the Monongahela to form the Ohio at Pittsburgh, 260 miles below the termination of the proposed canal. Upwards of 20,000 miles of navigable rivers, it is estimated, pour their waters into the Ohio and Mississippi Rivers, and of the fertile regions bordering on these waters, it is believed at least two-thirds would find the Genesee and Allegany Canal the most convenient channel to a market on the Atlantic. A large proportion of the States of Ohio, Pennsylvania, Virginia, Indiana, Illinois, Missouri, Kentucky and Tennessee, would make use of this communication. They would by this means avoid the uncertain market of New-Orleans, the circuitous route by the Ohio Canal and Lake Erie, and a passage by rail-roads over the Allegany mountains. It is evident that the route we propose to establish by this canal, must be preferred for cheapness, safety, and expedition combined, to any other that can be named, for the transportation of produce and merchandise to and from the Ohio valley and the Atlantic ports.

The reports of engineers who have surveyed the route of this canal, show, in the *first* place, that it may be constructed for an expense not exceeding $1,000,000; *secondly*, that its length will be about 90 miles; *thirdly*, that the lockage will not exceed that on the Chenango Canal, and will be less in proportion to its length than that on the Chemung Canal; and *fourthly*, that abundance of water to feed the canal is found on the summit level, from the Ischua Creek and other sources. It is also certain that the Allegany River may, at a small expense, be rendered navigable for steam-boats, and that the amount of tolls which would be collected on the canal would render its construction a profitable investment to the State.

The benefits which the city of New-York would derive from this work, are evident to every person of observation. It would greatly extend our trade with the interior, and open new channels for enterprise in the establishment of manufacturing and commercial villages,

which would pour their increasing trade into this commercial mart of America. Taking into view the great increase of trade and population which has resulted to this city from the construction of the Erie and Champlain Canals, it is deemed safe to estimate the enhanced value of real estate in the city of New-York in consequence of the completion of the Genesee and Allegany Canal, when that event shall take place, at five per cent. on the present amount, which was appraised last year at $104,042,405.

The distance of Rochester from Albany by the Erie Canal is 270 miles; from thence to Olean by the proposed canal, say 90 miles; total distance from Albany to Olean, 360 miles, and from New-York to the same, 510 miles. From Olean to Pittsburgh is 260 miles; thence to the mouth of the Ohio 960 miles; thence to New-Orleans 960 miles. Total distance from Olean to New-Orleans, 2180 miles, making an inland navigation from New-York to New-Orleans of 2690 miles.

With the expression of my anxious desire that the facts laid before the Legislature of this State by your Committee and from other sources, will induce them to authorize the early construction of this important work, I am, very respectfully, your obedient servant,

EDWIN WILLIAMS.

1. Table showing the effect of internal improvements on the value of real estate in the city of New-York.

1817	Real estate assessed at . . .	$57,799,435
1820	do. do.	52,062,858
1824	do. do.	52,019,730
	Erie Canal finished in 1825,	
1825	Real estate assessed at . . .	$58,425,395
1826	do. do.	64,803,050
1828	do. do.	77,139,880
1830*	do. do.	87,603,580
1831*	do. do.	95,716,485
1832*	do. do.	104,042,405

* Part of the Ohio Canal finished.

2. Table showing the increase of population in the valleys of the Ohio and Mississippi.

	Census of 1820.	*Census of* 1830.
Ohio,	581,434	935,884
Kentucky,	564,317	687,917
Tennessee,	422,813	681,904
Indiana,	147,178	343,031
Illinois,	55,211	157,445
Missouri,	66,586	140,455
Mississippi,	75,448	136,621
Alabama,	127,901	309,527
Louisiana,	153,407	215,739
	2,194,295	3,608,523

Increase in 10 years, 1,414,228, or about 70 per cent.

LETTER OF MR. STILWELL.

New-York, Dec. 17, 1833.

To the Committee.

Gentlemen—Your favour of this date is this moment received, and I hasten to say that my engagements are such as to preclude me from bestowing as much time on the subject to which your letter has called my attention, as I could wish, or its importance demands. It is, however, in every respect familiar to me, and has heretofore occupied much of my attention. My views relative to the propriety of an immediate commencement and speedy completion of the Genesee Canal, as well as the present and prospective importance of this work, are now well and extensively known, and I have no hesitation in saying, would have been urged upon the last legislature had not the estimated and established precedence of the Chenango Canal wholly occupied my attention.

I have long entertained the opinion that but few routes remain unimproved within this State which are worthy of the attention of the representatives of the people; and to enable me to form a correct opinion of their comparative importance, I have examined, with some care, the respective merits of all. Among those of the first importance, I class the Genesee Canal. I consider this work well worthy the attention and resources of the State, and am fully convinced that in every respect it will produce results highly gratifying and advantageous to the State and to individuals. Viewing it only as a link in a grand communication with the Ohio, by a ready, cheap, and direct route, and a sufficient reason is presented for its construction. But, when we consider it in a more national and enlarged sense, and recognise in it an extension of our Grand Canal, by which this city will be united with the immense regions of country through which flow the navigable rivers of the great and fruitful west, it swells from the minor importance of a branch canal to a rivalry with the greatest river on the face of the habitable globe.

Who can calculate the importance of a work of this description,

viewed at the expiration of twenty years, — at a time when, — and I venture the prediction, more products will float upon its waters than now find their way through the Erie Canal? Who will pretend to believe that the time is not at hand when steam-boats will ply regularly between Olean and Cincinnati, and when, if this canal be constructed, the transportation of goods to Pittsburgh will cost less than the insurance from New-Orleans?

Gentlemen, our country has but commenced in the march of improvement — the forest has scarcely receded beyond the borders of our State — our trade with the far west has hardly become known, and our enterprising citizens have but just opened upon the immense forest and prairie, lying between Texas and Michigan, the eastern waters of the Mississippi and the Rocky mountains.

What are we to expect when this rich and fruitful country shall be teeming with an industrious and thriving population — when the manufactures of Europe and New-England shall be pouring their fabrics into this vast region, and the products of the millions of acres of the most productive soil, shall be seeking a market at our principal sea ports? Can we for a moment believe that the facilities already provided are ample — that we are at all prepared to advance our claim to the trade of the far west — or that the naturally advantageous location of our favoured State, and the fearless enterprise of our merchants, can overcome, without the helping hand of the State, the many obstacles that are now presented?

What, I ask, are we to do? Shall we leave the merchant and planter of the west to pursue the course of the Mississippi, and deposit the results of an illimitable commerce, where the mighty river terminates in the ocean? Shall we, by neglect and inattention, give an impetus to a rival trade, or shall we, with as little delay as possible, improve the important natural advantages of our location? If we determine to make our country such as the formation of the surface has pointed out, and our hopes have promised — If we wish her to outrun every rival, and stand pre-eminent for enterprise, intelligence, and wealth — then we should spare no time, we should permit no delay to check the spirit or damp the enterprise which has so nobly commenced, and so ably sustained the honour of this great State and the permanent interests of her citizens.

To incur debt for so important a purpose, is a duty we owe to those who will succeed us. To posterity and to ourselves we owe the im-

provement of advantages which, if once lost, can never be regained. Debt to a new country, like ours, is the very vitality of its existence; it is the foundation of our prosperity; it is by it alone we can expect to be rich or great: to incur debt for objects like this, is an imperious duty, for by so doing we shall draw into our highly favoured State the trade of the great west — we shall make those immense regions, yet unpopulated, tributary to our children — we shall make our State the great ware-house of the Union — we shall make our city the great natural centre of this great confederacy — and we shall, by our exertions in this great cause, do more to continue the union of these States, than we can reasonably expect from any other cause.

I fear you will think me an enthusiast on the subject of internal improvement; and I confess if I am devoted to any one subject of public importance more than another, it is this. In this I am all for the interest and glory of my country; and could I, without *too* great a sacrifice, devote myself to the promotion of this great work, I would yield my most devoted exertions to the exclusion of every other object.

I feel that something should be done to arouse this dormant spirit among our people — to place before them in a clear light their own true interest, and press them to lose no time in entering the field manfully and fearlessly, and not abandon it until every avenue that is susceptible of improvement and every cause for exertion shall have been exhausted.

My apology for so diffuse a letter is my want of time; and in addition thereto, my intention, as soon as my engagements will permit, to prepare a statement of facts and reasons which shall sustain and enforce the general opinions I have here expressed, and which have, at different periods, been advanced, with a view to the establishment, upon proper principles, a system of internal improvements.

I am, gentlemen, your fellow-citizen,

SILAS M. STILWELL.

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